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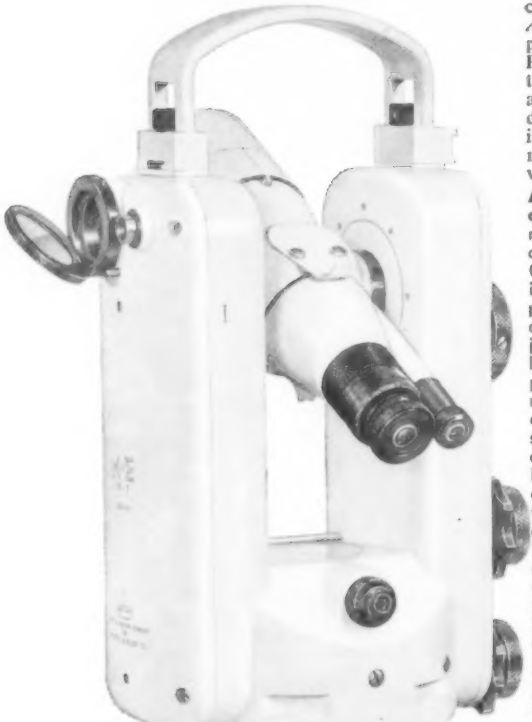

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Editor-in-Chief
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OF SURVEYING AND MAPPING

Volume XXI, No. 4
December 1961

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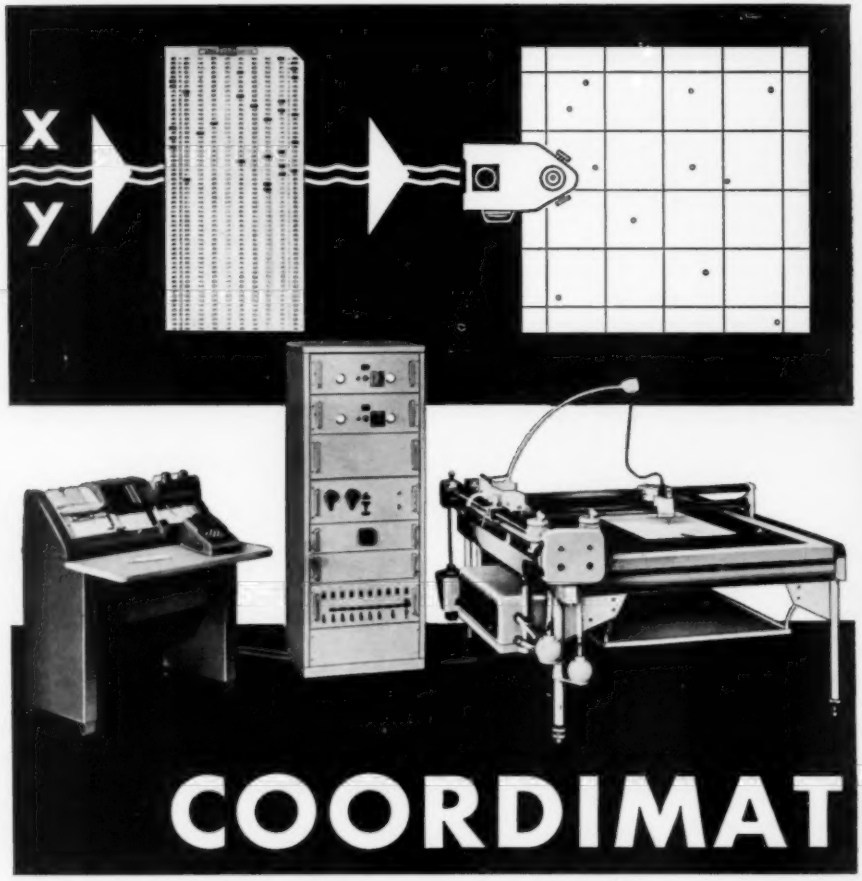

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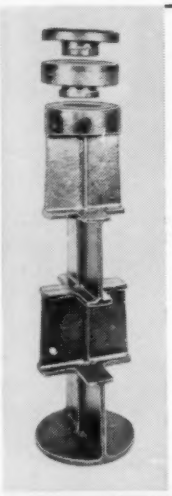

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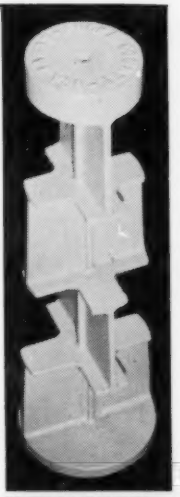

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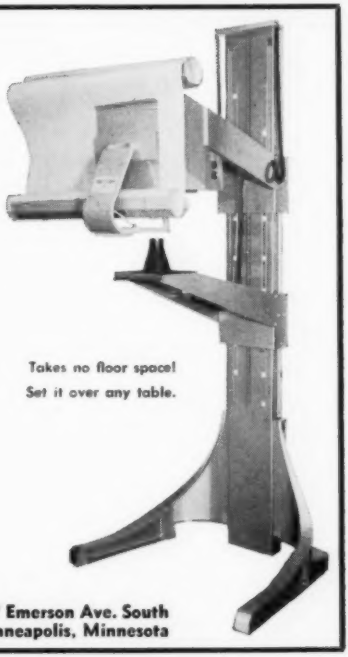

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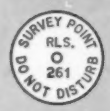

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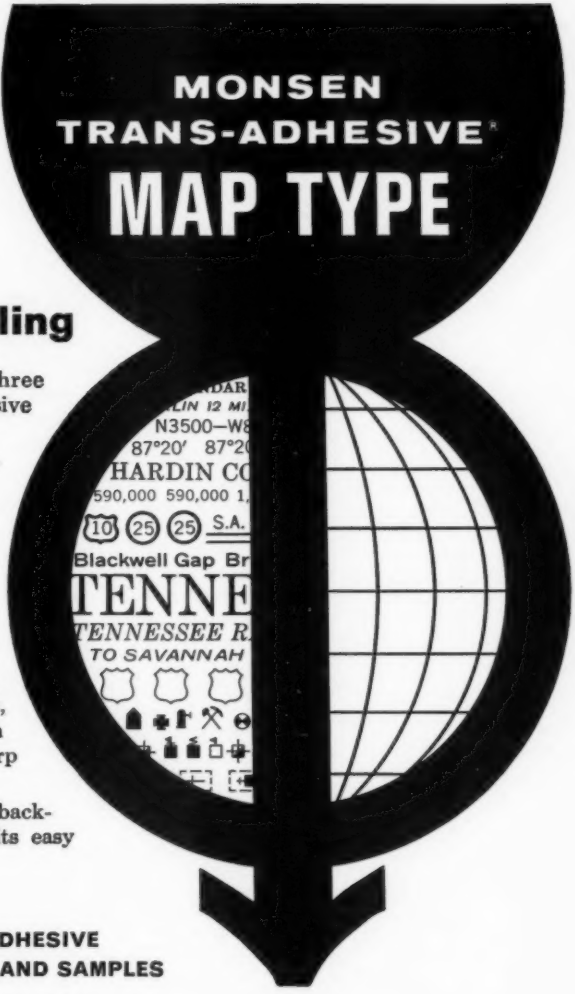

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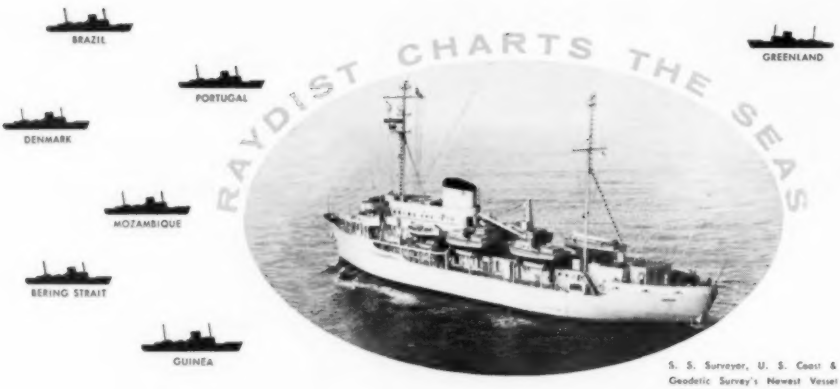

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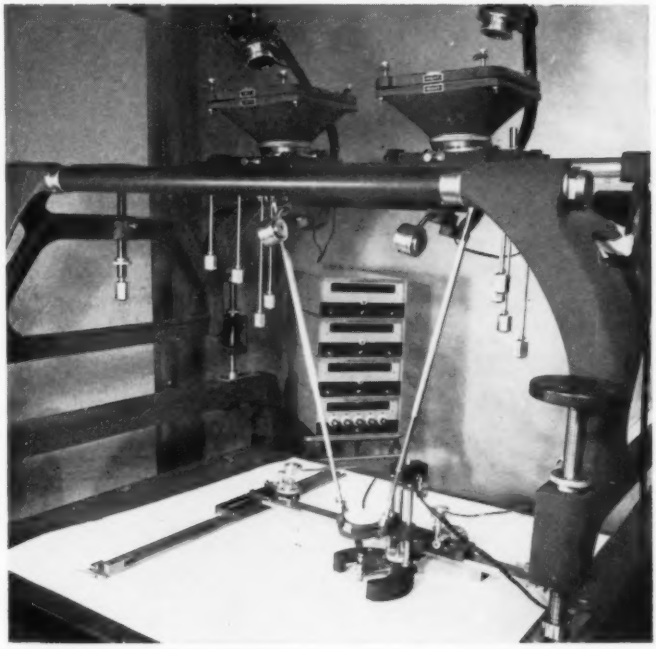

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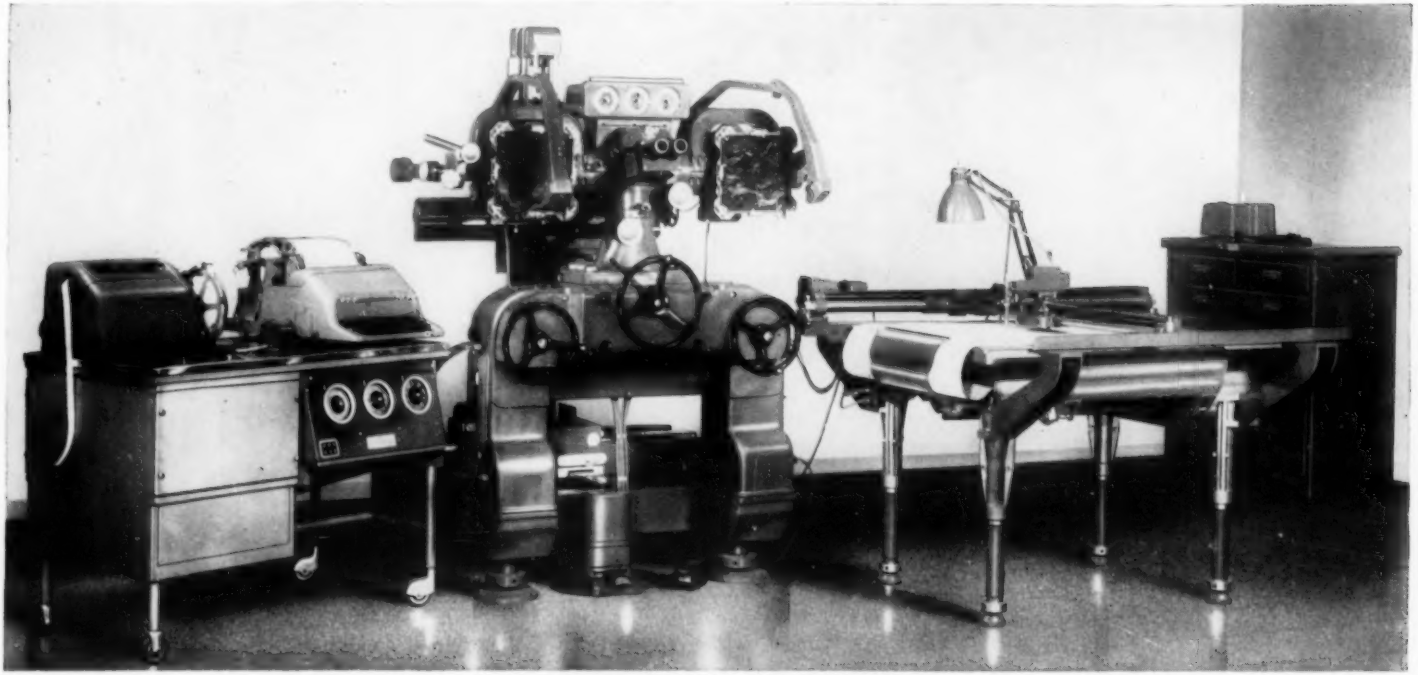

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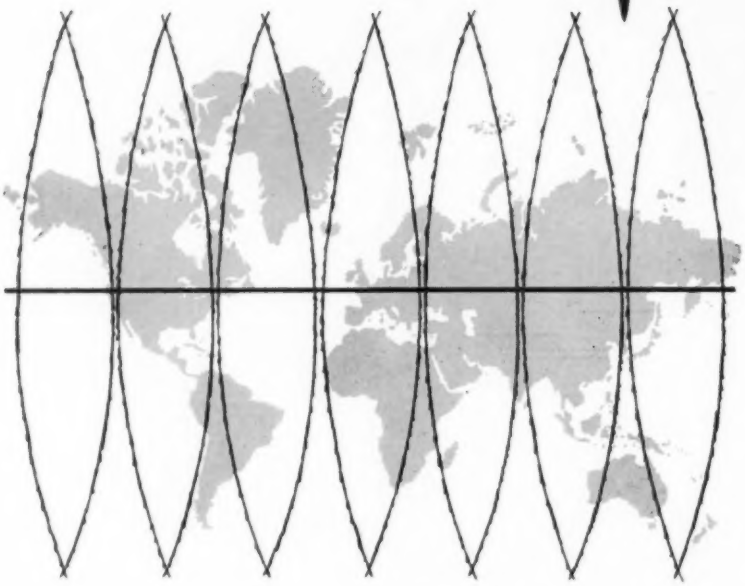

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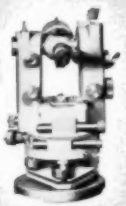

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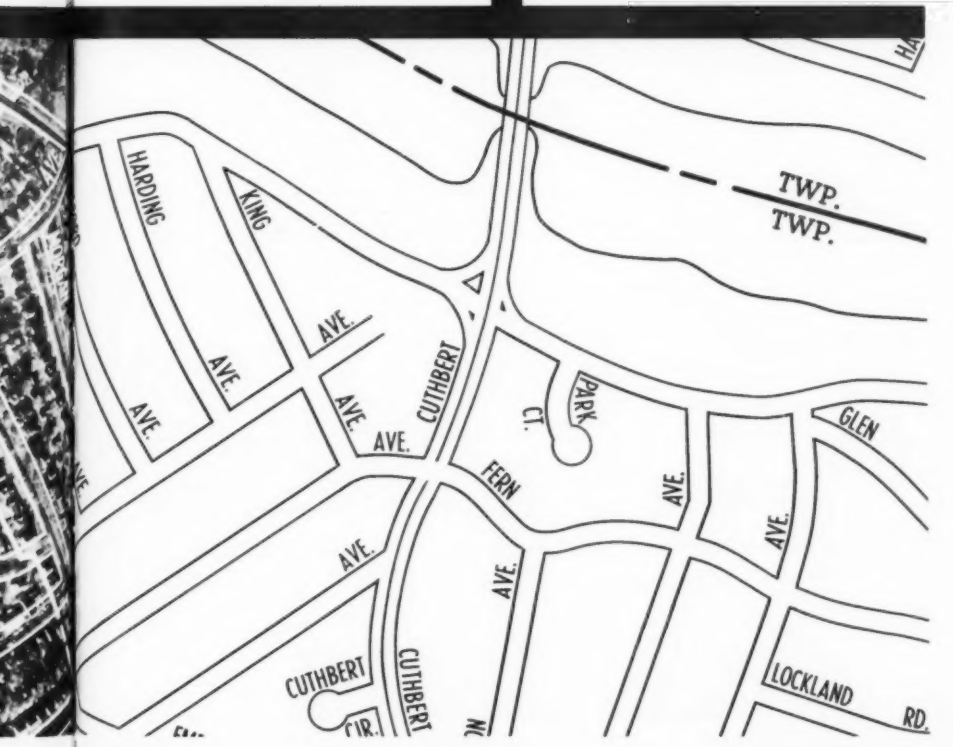

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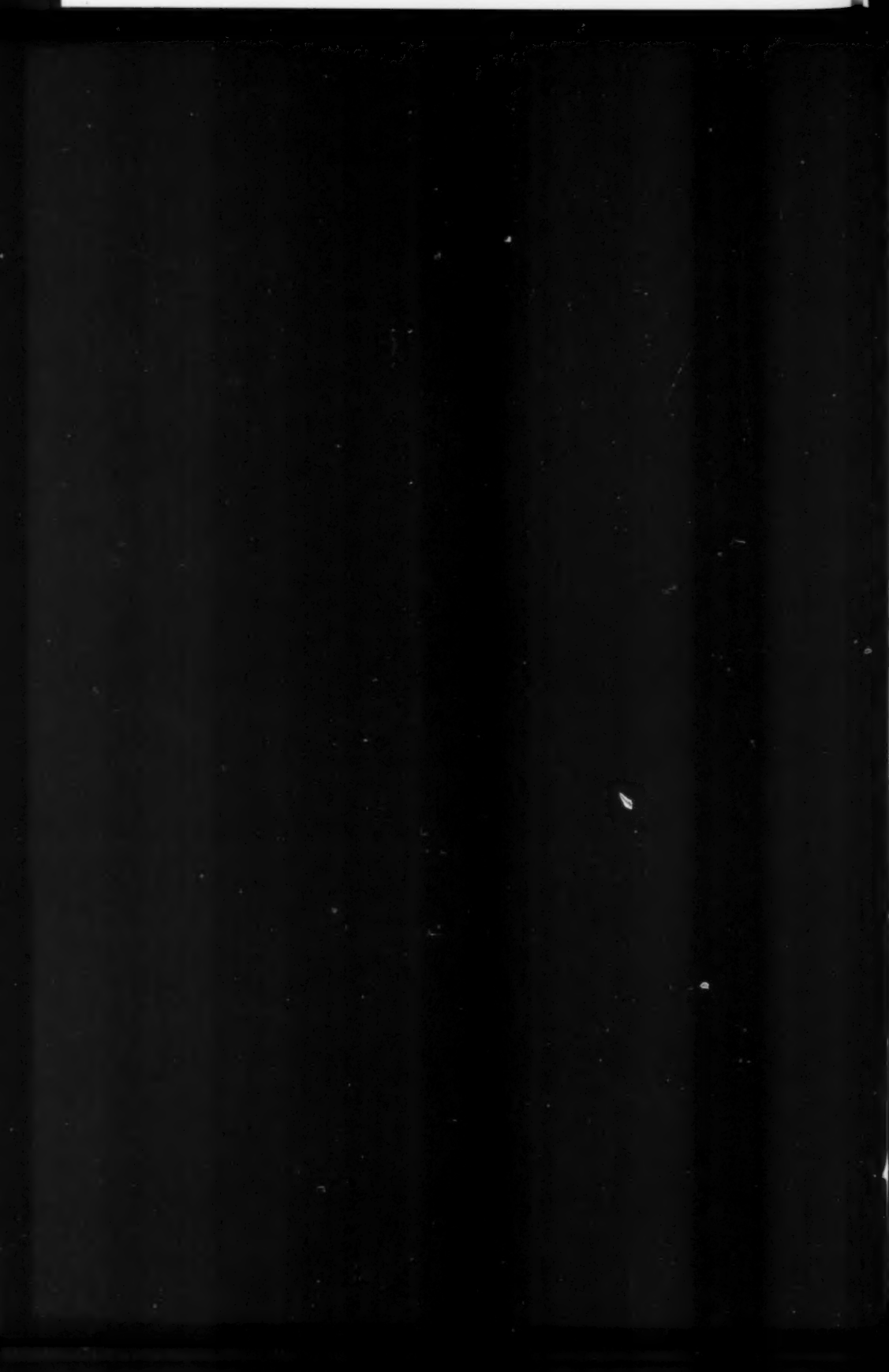

Exploratory Bathymetric Surveys in the Arctic Ocean

By ARTHUR E. MALLOY

U. S. NAVY HYDROGRAPHIC OFFICE

ABSTRACT: The atomic submarines conducting polar explorations have obtained continuous sounding profiles of the ocean floor. Prior to 1957, all soundings were obtained by drifting ice stations, ice breakers, drifting ships, and/or U. S. and Soviet plane landings on the Arctic pack. Methods and instruments used to obtain bathymetric data during the cruises made by the atomic submarines are discussed. Navigational equipment, including the Inertial Navigation System, is noted in addition to the standard types of navigation instruments such as the Bubble and Periscope sextants.

Nautilus, Skate, Sargo, and *Seadragon,* have transited the Artic to obtain the optimum bottom coverage in the allotted time and not duplicate previous routes. This has been accomplished during various times of the year, including periods of total darkness.

Space limitations aboard nuclear submarines affect the working and living conditions to a degree not experienced aboard surface ships. A typical day aboard a nuclear submarine in the Arctic is discussed along with methods used to reduce data for immediate use, if necessary.

The future of hydrographic surveys in the Arctic is discussed with particular emphasis upon the utilization of a nuclear submarine.

IN 1957 the *Nautilus* made the first extensive exploration under the permanent pack ice of the Arctic Ocean. With this cruise we can consider the Arctic Ocean to have been opened for exploration by atomic submarines.

Since the initial *Nautilus* cruise of 1957 there have followed the *Nautilus* transpolar cruise in 1958, which was the first west to east crossing of the Arctic Ocean by submarine; the *Skate* cruise of 1958, which was to collect hydrographic and oceanographic data during periods of 24-hour daylight; the *Skate* cruise of 1959, which was to perform the same duties during the winter and in a period of total darkness; the *Sargo* cruise of 1960, which was a winter cruise from Bering Strait to explore a shallow water transit area during total darkness; and the most recent cruise of the *Seadragon,* which completed the first transit of the Arctic Ocean from east to west via the legendary Northwest Passage.

Each of these cruises has carried a civilian scientific staff, the number varying with the program of operations and the time available for scientific studies. To date there has been little or no duplication of tracks and the routes traveled by the submarines during the Arctic cruises have been planned so as to obtain the maximum coverage in unexplored regions. Efforts have been made to cross previous tracks to check various bottom features.

The gross bathymetry of the floor of the Arctic Ocean has been known with certainty for only a very few years. Until the mid-1940's, the general impression of the floor of the Arctic Ocean was that of an abysmal plain unbroken from coast to coast and averaging in depth about 2,000 fathoms. During the years between 1930 and 1950, Polar research in (or rather "on") the Arctic Ocean had been carried out almost exclusively by the Soviets. Their method was the use of the now familiar "ice island" or drifting station of a semi-permanent nature. In addition, extensive research was carried out by the use of the especially designed aircraft which transported Soviet scientists and equipment to points in the Arctic inaccessible to the drift

* Presented at the 21st Annual Meeting of the American Congress on Surveying and Mapping, Washington, D. C., Mach 22–24, 1961.

station. At each landing various measurements were taken including a sounding. Prior to the Soviet interest in Polar science the cruise of the *Fram,* under the leadership of Fridjof Nansen during 1893–96, is perhaps the most significant historically. From these relatively scant data and data from similar expeditions, the Arctic ocean-floor features were delineated.

The past decade has shown a continued interest in Polar studies by scientists of many nations, and the military establishments of this country have expressed an active interest in the advancement of knowledge in the Arctic regions. U. S. icebreaker expeditions along the fringes of the Arctic Ocean and Air Force plane landings in the Central Arctic have also contributed to the fund of Arctic knowledge. A great impetus resulted from the recent studies carried out during the International Geophysical Year. In recent years the U. S. Air Force has manned an ice island for Arctic studies termed T-3 or BRAVO. An additional drift station ALFA, supported by the Air Force as part of the IGY program was manned during 1958 and 1959. Scientists from the Woods Hole Oceanographic Institution and the Lamont Geophysical Laboratory of Columbia University who have occupied this station have collected and analyzed much data pertaining to the Arctic Ocean.

The limitations of this type of research can be seen at once, particularly in regard to the studies of the ocean floor. First among these is the slow movement of the observing platform, in this case the ice pack itself. Secondly, the ambiguity of position during periods of overcast and third, the inability to control the direction of drift. Undoubtedly, there are advantages to this type of research station for other scientific fields, and for many years information pertaining to the ocean floor was available only from this type of platform.

This then brings us back to the submarine and the methods which can be employed for gathering data. The general public finds it difficult to conceive the idea of the north polar region as a true ocean. True, there is a semipermanent ice cover which has tended to create an impression of "landscape." This, I believe, has been diminished somewhat by the nuclear submarine voyages and the publicity given the International Geophysical Year.

Discussion of the submarine trips to the Arctic usually brings the following questions from those engaged in the geographic sciences:

1. How do you avoid the ice when submerged, and how do you surface through the ice?
2. How do you determine your position?
3. What instruments do you use to measure depth?
4. Other than scientific data, what is the usefulness of the information collected?
5. What are the living and working conditions aboard a submarine?
6. What new information is available as a result of the Arctic cruises?

In answer to the first question there is need of a short explanation. The Arctic Ocean is covered by ice which varies in thickness from season to season as well as regionally. The average thickness in the Arctic during summer or winter is from 9 to 12 feet. This ice cover is in continual motion, and, from time to time, depending on surface winds and ocean currents, openings occur. This phenomena happens summer or winter, but is more prominent during the summer months when there is a warming of the air and ice decays to some extent. Openings that do occur, in the summer do not generally re-freeze although they do close up because of the motion of the ice. During the winter months openings occur but immediately re-freeze at a rate proportional to the air temperature. The openings are named depending on their size: a narrow opening is termed a "crack;" long, wide openings are termed "leads;" and pond or lake size openings are termed "polynya," a term borrowed from the Soviets. These openings are detected by SONARS designed to distinguish between the water surface and the ice cover. The underside of the ice is not smooth but is studded with hanging pillars of ice which may extend down to a hundred feet or more. These pinnacles or "pressure ridges" are

Official Photograph, U. S. Navy

Members of the crew of the *Seadragon* dot the Arctic ice as they collect information during the polar cruise in the summer of 1960.

Official Photograph, U. S. Navy

The author and W. I. Wittmann, Oceanographer, U. S. Navy Hydrographic Office, examining the re-freezing of a small lead in the Arctic Ocean in the winter of 1960. Air temperature, −15° F.

formed by the interaction and pressure of adjacent ice flows. The surface form is seen in photographs which give the appearence of hummocks or ridges, adding to the topographical conception of the surface. To detect these "pressure ridges" a sonar designed for this purpose is mounted on the submarine. It is a most valuable accessory, particularly when transiting shallow water areas of the Arctic and detecting icebergs. Surfacing is accomplished by observing the sonar display and selecting what appears to be a suitable opening. The submarine is then carefully maneuvered into position for surfacing. During winter operations the same procedure is used, except that, in many cases, the ice cover must be penetrated. How much of the submarine will be exposed often depends on the ice thickness. Usually only the "sail" or conning tower is allowed to penetrate the ice.

The second question, regarding position determination, can be answered quickly. Prior to all the recent Arctic voyages, each nuclear submarine has been equipped with Inertial Navigation equipment in addition to the standard instruments found aboard every submarine. Occasionally additional instruments are utilized for checks or evaluation. The periscope sextant and celestial altitude recorders are among those which have been evaluated. Navigation, always leaving much to be desired in Arctic regions, has been exceptional.

The third question pertains to depth-measuring instruments, and in the case of every Arctic cruise the Navy echo-sounder, designated AN/UQN sonic sounding set, has been used. In addition, the Precision Depth Recorder has been standard equipment for most of the Arctic cruises. The advantage of scale expansion makes this instrument a most welcome addition for the interpretation of ocean-floor features.

Official Photograph, U. S. Navy

U. S. S. *Sargo*—Skate class nuclear submarine—surfaced in the Arctic during the winter, 1960.

During the recent cruise of the *Seadragon* through the Northwest Passage a shallow-water echo-sounder was added. For this operation, the officer of the deck could utilize the visual display of the UQN. A graphic recording was obtained by the EDO-255 for charting purposes.

The fourth question, of what immediate use is the information obtained, requires some discussion. For oceanographic use the bottom topography explains in part the mass transport of water in the Arctic Ocean. The properties of underwater sound in the Arctic may be better understood if the topography of the ocean floor is known. The most important immediate use is, of course, for the safe navigation of the Arctic. Charts utilizing the soundings are available to the submarine force and certain prominent features are definitely of the nature of "landmarks," and these ocean-floor features offer a check as to position. In shallow areas, the soundings are added to existing charts as they are obtained, to facilitate the exit of the submarine in certain passages.

Question five cannot be easily answered because each submarine is different, not necessarily by visual inspection of the exterior but by interior layout, equipment, space limitations, and personnel. It might be easier to answer this question by assuming a hypothetical set of circumstances and then discuss an average day aboard a submarine in the Arctic.

For our discussion, we are aboard a *Skate* class submarine, about 265 feet in length and 25 feet in diameter. There is a large "snail" which encloses the periscope, masts, and antennae which project about 16 feet above the weather deck. Access is from the sail or flush deck hatches fore and aft. Little else will be visible, the hull being almost free of projections.

The main deck is comprised of the control room, attack center, and wardroom area. This is the area of activity for control of the submarine and is where most of the instrumentation for data collection is placed. The echo-sounder or sounders are easily accessible to the officer of the deck,

THE ARCTIC OCEAN'S "NEW LOOK"

and the navigator's table is in constant use for plotting purposes. During the Arctic cruises the echogram is analyzed daily and all soundings and important features are plotted, ready for use should they be needed. The ship's track is adjusted and all logged information checked for accuracy. In this way ambiguities can be resolved as they occur. Courses are often requested and recommendations submitted to the Commanding Officer are based on results of findings during the cruise. Maintenance of instrumentation, watch standing, and assisting the other scientists with their work projects are routine. Facilities for the necessities of life, such as meals, bunk space, and recreation are available to the embarked civilians, but the tempo of activities during a cruise of this nature leaves little time for recreation, except for an occasional movie or card game. Space is always at a premium and life is compressed into a relatively small area.

If a surfacing is contemplated, everyone who has duties topside is busy dressing for the outside weather. The stable air-conditioned atmosphere aboard a nuclear submarine gives no clue to the outside conditions which prevail in the Arctic. The surfacing, once accomplished, brings the sightseers out on deck or on the ice, and with them instruments are carried up and over by the scientists. All work "ashore" is performed in pairs as the dangers of cracks or shifting ice, injury, or polar bears is always present.

The work completed, we collect our equipment, board the submarine, and, upon completion of all other duties, submerge. Once aboard, the cataloging and analyzing begins, and then back to regular underway duties. The officers and men of the submarine force have been more than cooperative, in fact, their enthusiasm with regard to a scientific program has been extremely gratifying. Without their participation and

cooperation there would be little to report.

The sixth and final question pertains to the actual bottom topography of the Arctic Ocean as observed during the submarine voyages. We have known for some time that the bathymetry of the Arctic was more complex than was first supposed. The Soviets, in recent technical literature have included bathymetric charts of the Arctic. These are presumably based on the data collected from their drift stations and the numerous airplane landings. Recent papers by American scientists are the results of data obtained from the American drift stations ALFA and BRAVO. One exception is a paper presented at the International Oceanographic Congress by Dr. R. S. Dietz who divided the Arctic Basin into physiographic provinces. This paper was based on results obtained from Navy icebreaker tracks and the *Nautilus* and *Skate* cruises of 1958.

The original concept of a great Arctic basin is no longer valid. The Arctic is a complex ocean, topographically, with a prominent ridge, the Lomonasov, extending from Ellsmere Island to the New Siberian Island. The north geographic pole is at the base of this ridge in the Eurasian Basin. The western Arctic basin has ridges parallel to the Lomonasov, while the eastern area of the Arctic Basin is comprised of an abysmal plain studded with numerous seamounts. The analysis of findings is still being carried out, but many areas are still to be examined before final conclusions can be reached. Each year as new information is gathered we can expect newer aspects to emerge pertaining to the gross bathymetry of the Arctic.

The future of Polar science appears to be brighter with each passing year. As we map the information from each trip we are better able to produce the navigation charts so urgently required in those remote areas and are able to furnish more data pertaining to the environment.

The Arctic is no longer a question mark on the surface of our planet, and continuing efforts will enable us to consider this ocean as another waterway for whatever purpose we may desire.

Great advances have been made in the equipments for submarine exploration and, in the years to come, we may find the submarine to be the true ocean survey ship of the future. The need for charts, hydrographic information, and oceanographic data directly related to submarine use is apparent, and further efforts should be directed toward these ends.

Frank Pace, Jr., to Serve U. S. Government Again

Frank Pace, Jr., Chairman of General Dynamics Corporation, has been chosen by President Kennedy to be a member of the President's Foreign Intelligence Advisory Board now headed by General Maxwell D. Taylor.

On behalf of official Washington—back in June 1948—Mr. Pace, then Assistant Director of the Bureau of the Budget, gave an address of welcome to the Eighth Annual Meeting of the ACSM. He became Director of the Budget and later, just before the Korean War, President Truman made him Secretary of the Army. Already seasoned in politics and government administration at the age of 49, Mr. Pace will serve in the advisory post part-time.

Mr. Pace is well acquainted with the importance of surveying and mapping to provide information and basic intelligence for solving many of the nation's problems. He has said,* "The problem with us in the Office of the President is not how can a dollar be well spent but how can a dollar be best spent." In addressing the ACSM he said, ". . . you are in a position to provide us with the information that we need. . . . the factual knowledge of what development must come first, what development must be retarded. You are in a position to provide us with information as to how Government may best spend each dollar, and it is in this vein that I am sure that this Congress (ACSM) is working."

Mr. Pace said that he had a great personal interest in the work done by members of the ACSM, due primarily to a thorough familiarization of professional surveying and cartography by the ACSM's first President, Robert H. Randall, who was then also with the Bureau of the Budget.

* See SURVEYING AND MAPPING, July–September 1948, Vol. VIII, No. 3, pages 111–114.

Model of Ocean Bottom Completed

By LEONARD N. ABRAMS

PANORAMIC STUDIOS, PHILADELPHIA, PENNSYLVANIA

THE MODEL of the North Atlantic Ocean Bottom, recently completed by Panoramic Studios for the U. S. Naval Training Devices Center, represents the first known attempt at a model of such a large underwater area on an accurate and detailed basis.

In its initial stages the project necessitated the compilation of a map at the scale of 1:10,000,000. The reference materials supplied by Robert Wyener, Scientific Officer for the Center, included the Hydrographic Charts of the North Atlantic Ocean and the Bottom Contour Charts (U. S. Navy Hydrographic Office) and the charts of the International Hydrographic Office (Monaco), as well as numerous charts from British, Norwegian, German, and Russian sources. Most of the source material was not at the scale being used, and in many cases the soundings had to be changed from metric readings to fathoms.

Of particular value were the various papers by Dr. Bruce Heezen of Columbia University's Lamont Geological Observatory, some of which he was kind enough to make available as pre-publication proofs for his book "The Floors of the Oceans," Special Paper No. 65, published by the Geological Society of America in 1959. Much helpful advice and information was supplied by the eminent cartographer of the American Geographical Society, William Breisemeister, who acted as consultant on the map compilation and later phases of the work.

An initial compilation had been virtually completed when important additional material became available—so back to the old drawing board!

Upon completion of the compilation and drafting, the model construction was begun in the Philadelphia workshop. The contours were cut, negatively, at 100 fathom intervals, laminated into a single registered block, and a stepped positive casting was made in reenforced epoxy plastic. This strong and accurate base was then modeled over with clay, inch by painstaking inch, with the pertinent reference map sheets hung conveniently nearby for ready reference.

The forms began to emerge on the model, unlike anything previously encountered in Panoramic Studios highly varied experience: the gigantic upthrust pinnacles of seamounts, on whose very peaks are perched the familiar Atlantic Islands such as Bermuda; and the tremendous sweep of the Continental Shelf breaking sharply downward to the abyssal plains. Snaking through the center of the model there appeared the jagged mass of the Mid-Atlantic Ridge, with its deeply rifted center. The land forms on the adjacent continental masses looked trivial by comparison with the underwater features! A vertical exaggeration of 1:25 was required to make these landforms read at all well.

The most extreme conditions appeared in the Caribbean corner, especially where the mass of Puerto Rico is situated directly alongside the deep, almost vertical, cleft of the Puerto Rico Trench, 4358 fathoms down. This extreme situation imposed such an unusual stress on the vacuum forming process originally planned that the first copies made for the Navy have been cast in reenforced polyester plastic. These light, strong, copies reproduce every detail of the master model with exact fidelity.

The completed scale model represents a striking improvement over any of the two-dimensional media used to portray this information. Despite the limitations of the scale a great deal of detail has been included. Many forms and relationships stand out with exceptional clarity. It is hoped that the model and its copies will be of assistance to further studies in this vital field.

Techniques of Relief Representation

J. S. KEATES

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ALTHOUGH some attempt was made on early maps to indicate major differences in terrain, it was not until the introduction of large-scale ground survey and the resultant contour map that it became possible to consider the proper representation of relief in any systematic way.

Map symbolization and design have, at all times, operated within the limits set by the available reproduction processes. Style of a particular period is more a reflection of technical facilities than an arbitrary, if artistically-inclined, choice. Whatever technique is adopted, the central problem remains clear—the re-creation of the three-dimensional surface by two-dimensional symbols. This may be achieved by either abstract or realistic symbolization, but abstract symbols have the disadvantage that they are concerned with creating a visual impression of reality, while the map user assumes they do so directly and without qualification.

At this point it is necessary to clarify some terms. Relief includes variations in slope and character of the earth's surface, but does not necesarily involve altitude. Therefore, the contoured or hypsometrically-tinted map is not regarded in this context as a relief map, although such symbolization frequently supplements other forms of relief representation.

Whatever theories are involved, from the point of view of the map user relief portrayal is automatically associated with "realism," in the sense that landscapes of the earth are commonly apparent and to a varying degree within everyone's experience. This is not so true with regard to altitude, which is relatively more abstract, and not visually obvious. Inevitably, therefore, the criterion of realism is applied, and this is generally accepted by cartographers as their main objective.

With these facts in mind, two main groups of relief techniques may be distinguished. The first is concerned with indicating slope variation and form by (a) symbols indicating degree of slope, either mathematically expressed or visually assumed, or (b) symbols based on profiles. The second group gives a three-dimensional impression by employing light and shade. As shading is often added to techniques employed in the first group, there is no absolute demarcation between the two groups. Although systems based on profiles shown in perspective are not always true maps—in that they are not planimetrically correct—small-scale orthographic projections and repeat profiles have been used extremely effectively in presenting relief forms.

What lies behind our concepts of light and shade is not immediately obvious. The main source of confusion lies in the failure to distinguish clearly between what is meant by shadow in the usual sense, and what is meant by illumination. Shadows are caused by obstructing light, and this is a question of position in relation to a source of light. A shadow bears no relation to slope as such. The brightness of any area of land is affected by the amount of light reflected, and this is due to the nature and angle of the surface in relation to the light source or sources. True shadow, such as those in very deep valleys, may obscure all slopes equally, and, therefore, cannot be used to show variations in slope.

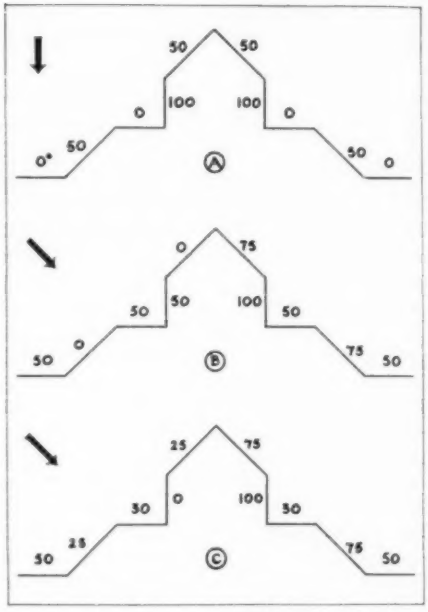
The relief cartographer is, therefore, primarily concerned with variations in degree of illumination and takes into consideration both direct light and reflected light. Lack of understanding of this leads to overconcentration or "shadows" and results in relief portrayals which show only a limited range of shadow sides and ignore distinctions between horizontal and light-facing slopes. The range covered should, in fact, vary

from full illumination (perpendicular to the source of light) to complete shadow (no illumination at all). Where a vertical light source is assumed, this is simply expressed as "the steeper the slope the darker the shadow," as all horizontal surfaces are perpendicular to the direction from which the light comes. As a map is viewed in plan, this system is certainly the most logical. Theoretically, where an oblique illumination is assumed, slopes lying at right angles to the direction of the light source would have the maximum light reflection, but they may not be the steepest slopes unless the light is assumed to come from a horizontal direction. In such a case level areas would have no direct illumination.

Despite the pleas of those who use maps in the field (map orientation not affecting the relief picture when vertical lighting is used), the system of oblique lighting is now predominant and is almost synonymous with hill-shading. The theoretical concept of this is shown in Figure B. All level areas carry a degree of tone; slopes facing the light have variations generally lighter than this; and those facing away from the light are darker. In fact, the system generally employed approaches what is shown in Figure C. Vertical features on the light side are lightest in tone, and higher level areas are lighter than low level areas. The concept of a level-land tone, often shown repeated as a separate tint in color or integrated with a modified scale of hypsometric tints, clearly distinguishes the most successful forms of hill-shading from those that are only concerned with "dark side" shadows.

Although oblique hill-shading is only valid when the map is normally oriented, it is not necessary to maintain one light direction. Terrain areas can be illuminated from different angles, although the angle of light must be uniform within any relief unit.

The "art" involved in hill-shading, like most forms of cartographic symbolization, is a matter of suitable exaggeration. This factor, together with the rigidity of illumination involved, is what makes a photograph of a relief model so unsatisfactory compared with an artistic drawing. Hill-shading is not an attempt to copy what exists in nature, but applies systematically what happens in a landscape only momentarily. The shadows generated on an illuminated model tend to be flat and even in intensity. The artist deliberately modifies and exaggerates them to show slope variations effectively.



FIGURES A, B, and C.—Percentage of shadow: A shows vertical illumination, B shows theoretical oblique illumination, and C shows oblique illumination as commonly practiced.

CLASSIFICATION OF PRODUCTION TECHNIQUES

Two main groups can be established in the classification of techniques: (1) those based on a single original, whether reproduced in one or more tones, and (2) multiple originals produced either separately or photolithographically. A third group comprises color-originals reproduced by color-separation, but, as these involve more than the representation of surface form, they are excluded from this discussion.

SINGLE ORIGINAL TECHNIQUES

Hachures

Hachures may be used either in the visual sense, where the line pattern provides a form of shading and slope is interpreted by eye, or may be constructed as symbols expressing defined degrees of slope. In the days of engraving hachures were the natural development of a system of hand-drawn line patterns and, in common with all such areal symbols, suffered from competition with other line work. Their various forms and combinations, depending on the source of light used, have been analyzed and described in detail elsewhere, notably by Prof. Ed. Imhof in his "Terrain et Carte." They may still be successfully employed by cartographers limited to line reproduction, but their drafting is a laborious and exacting procedure.

Simple hill-shading by pencil

Probably the commonest form of relief drawing for hill-shading is the simple pencil drawing in which all tones are applied by hand. Almost any medium receptive to pencil or crayon may be used, ranging from opaque materials such as paper, board, or enamel-coated plate to translucent materials such as tracing paper or mat plastic. Translucent materials have the great advantage that they may be placed over the contoured base, drainage, or other key drawings. Drafting materials are very much a matter of personal choice, but generally a combination of a "B" pencil and a darker wax or charcoal pencil, such as a Faber "Zorn" or Hardtmuth "Negro," is used. I find the Caran d'Ache Fixpencil 3, together with a thick 4B lead, convenient for most purposes. Most cartographers use a paper stub to merge and soften the gray tones. When working on mat plastic which is not white in appearance, a white pencil can be used to pick out and solidify the highlights.

The difficulty of this technique, especially for maps including extensive areas of low relief, is the creation of even tones over large areas. This, together with the objective of providing the process camera with a continuous, even, middle tone, led to the development of several refinements on this basic technique.

"Middle-tone" hill-shading by pencil

(1) Gray base technique.

A system used by a leading German cartographer, Dr. H. Mietzner, and derived, I believe, from the work of Dr. F. Hotzel, is both simple and effective. On a normal, mat plastic sheet, all slope areas are either darkened or lightened, using black or white pencils. This overlay is placed over a gray-toned paper, which gives all unshaded level areas an even gray tone, and sharply defines the transition from slope to plain. The whitened highlights stand out clearly against the gray background. The sharpness of contrast at break of slope is an outstanding feature of this system.

(2) "Dark-plate" technique.

This system was devised by J. F. Wilson of the U. S. Navy Hydrographic Office. It works on much the same principle, but the drawing is made on a translucent plastic sheet which has been lithographically coated with a gray tone. The gray tone may be darkened by pencil or ink drawing, or may be lightened by erasing. It is, of course, photographed over a white base.

(3) Hill-shading by airbrush.

Where the production of a large series of maps is involved, and especially where a "soft" or subdued relief is needed for background only, the airbrush has many advantages. It can be used as a simple direct technique, by which middle tones are applied, or it can be used as a variant of the middle-tone technique. The use of ink or watercolor on a plastic sheet has the advantage that shadow edges can be scraped clean with a knife where sharp distinction is required. Where over-all soft tones are needed to distinguish major "light sides" or "dark sides," it is a more fluent technique than any other, and for this reason is probably more widely used for small-scale relief drawings where the correct emphasis of major geographical form is important. To my knowledge the Paasche Fine Arts airbrush is the only type used for this kind of work. An ordinary black watercolor gives perfectly good results and can be supplemented by drawing with brush or pen.

A map can be executed either by using black transparently or by employing a range of opaque grays to match different slope and shadow categories.

MULTIPLE ORIGINAL TECHNIQUES

Techniques based on hill-shading, and those using some form of profile or perspective drawing, may consist of more than one original. Shaded drawings generally lack distinction in obtaining full contrast between level areas and slopes and in obtaining clear contrast within dark shadows. This is due partly to the softening effect of the screen, partly to the reduction of visibility caused by interference of other map detail, and partly because relief portrayal on most maps is subdued to maintain the legibility of other map elements. To offset these limitations, many combinations have been tried. Level lowland areas, shown on the relief drawing as a middle gray tone, can be amplified by making a separate mask of these areas and overprinting in another color. Similarly the areas of dark shadow may be redrawn on a separate overlay and overprinted in a stronger color, generally a half-tone of the dark blue or violet which may already be in use for other map features.

Multiple colors from one original.

The labor of obtaining this extra emphasis from separate drawings, and the difficulty of achieving correct repeat of tone detail, naturally led to attempts to achieve the same end by mechanical means. The single original can be photographed normally for the full tone range and photographed again with underexposure. This results in a negative retaining only the darker shadows. This image can be overprinted in a stronger color or tone. A technique of this kinds is, in fact, used for the relief sheets of the Ordnance Survey 7th Edition One Inch of Great Britain.

To go a stage further, attempts have been made to combine hypsometric tints with relief portrayal, by masking the relief drawing into the component elevation zones and printing these as a graduated color series.

Profile techniques.

In addition to hachuring and hill-shading, a number of systems have been evolved, mainly by American cartographers, which all have the profile in some form as their common denominator. Some are designed for true maps, i.e. they are planimetrically correct even though the relief forms are viewed obliquely. Others are more properly perspective drawings, but for the small scales involved they give a highly realistic impression of relief.

These systems are generally associated with simple line illustration, for teaching aids, text books, or magazine illustration. With few exceptions, therefore, they come under the heading of single original techniques, although they could well be combined in color with other map elements or make use of color combinations integrally. It is a curious example of European predominance in the cartographic tradition, that the shading systems of European origin have dominated topographic maps, and nearly all atlas and small-scale maps in color, despite their limitations, while the profile techniques remain comparatively undeveloped. The main types are as follows:

I. Perspective maps, correct planimetry.

A. Physiographic maps, originating mainly from the work of Lobeck.

B. Landform maps, as developed by Prof. Raisz.

C. Pictorial Terrain, the system evolved by Prof. A. H. Robinson and N. Thrower.

All these techniques present terrain forms by some method of profile, viewing the terrain obliquely. The pictorial terrain system is most closely allied to the contouring on which it is based. Physiographic and landform maps are more clearly personal interpretations derived from topographic and geological study, but are none the less valid for that. At small scales they are not necessarily less "accurate" than highly generalized contours or layer-tinted elevations, although these are more readily accepted as "true" maps.

II. Perspective drawings are normally "global" or "contintental" views, in which part of the earth is seen in perspective. They are typified by the work of R. E. Har-

rison, and are often regarded as examples of "journalistic" cartography. In the degree of realism which they achieve, they can be far superior to more conventional expressions of relief, and it is perhaps their success in communication that gives them the label of being "popular" in the journalistic sense.

PROBLEMS AND POSSIBILITIES

Whatever technique is used to produce the originals, their reproduction by photolithography is almost a common factor, and in some respects a common disadvantage. With few exceptions, shaded relief is used as a background image to a map carrying other detail. If it is printed strongly enough to reveal the full variation of tone contained in the original, it has an obscuring effect on the other map features. If it is rendered as a light background tone, then the maximum contrast between light and shade is correspondingly reduced, and much of the visual impression is lost.

With this in mind, it is even more unfortunate that the general necessity of using the halftone screen for reproduction by offset is itself a factor in tone reduction. Not only do the screen dots break up edges, but they reduce the contrast between similar tones. The use of the 300-line screen minimizes this, but it is a general limitation which the cartographer must keep in mind, and which can only be countered by making the original harder and "sharper" than normal.

The most common failure in reproduction lies in the extremes, the complete highlights and the vary dark shadows. Unless some process is used to avoid it, the faint halftone dot will appear everywhere, causing a loss in intensity for the full highlights. If screening is done at the first negative stage, the highlights can be opened by retouching the negative, but this tends to leave a hard edge, and is difficult and time-consuming to do. Where the halftone screen is used after a continuous tone negative has been made, there is a better possibility of masking the highlights and at the same time "vignetting" them to give a soft edge. In this case the "sandwich" would consist of; highlight mask—transparent plastic sheet 0.5 mm thick—continuous tone negative—magenta screen—film.

Obtaining full contrast in the dark tones is more difficult to accomplish, and many experiments regarding this are being made. The use of luminous paint, to obtain better light reflection from adjacent dark shadows, has been suggested. It is generally believed that the production of a continuous tone negative, followed by contact screening, gives a better rendition of tone contrast than photographing through a screen.

At present, the tendency to employ some form of relief representation on both large-and-small-scale maps is in full swing. Many hill-shaded topographic maps recently produced seem to have reached the ultimate in the combination of hill-shading with the presentation of other detail. My own feeling is that it will be fruitless to attempt to push this method any further. Certainly obliquely-lighted hill-shading, depending as it does on the visibility of the highlights, is doomed initially when combined with strong layer tinting, and the marriage of these two systems is nearly always unfortunate. Even when dark shadows remain, sharp color changes on the light side destroy the balance of the highlights. I firmly believe that the improved representation of relief on maps carrying other detail and produced in several colors lies not with further refinements in shading techniques, but with the adoption of other systems in more carefully constructed forms. The scribed profile—which would not interfere with the use of color tones for other map elements—has yet to be explored.

REFERENCES

A New Method of Terrain Representation. A. H. Robinson & N. J. Thrower. *The Geographical Review*, Vol, 47, 1957.

Landform, Landscape, and Land Use Maps. Erwin Raisz. *Journal of Geography* 45, 1946.

A report from the Ordnance Survey of Great Britain. Brig. L. J. Harris. Second International Cartographic Conference. Chicago 1959.

I am also indebted to Mr. C. Sjölander of Esselte Map Service, Stockholm, for technical advice on vignetting highlights.

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The International Cartographic Association First General Assembly

The American Congress on Surveying and Mapping, the official non-governmental organization representing cartographic activities in the United States, was represented by seven delegates at the First General Assembly of the International Cartographic Association held May 29 to June 3, 1961, in Paris, France.

This organization was conceived at the Esselte Conference on Applied Cartography held in Stockholm, Sweden, in 1936, where it was proposed that the idea of more extensive international cartographic cooperation be investigated in various countries.

This proposal was later developed by delegates to the Second International Cartographic Conference, sponsored by Rand McNally & Company, at Evanston, Illinois, in 1958.

Another meeting was held in Mainz, Germany, in November 1958 to discuss, more in detail, plans for furthering the establishment of an international organization.

The national delegates to the Mainz meeting met again at the Bern Cartographic Conference in Bern, Switzerland, June 9–10, 1959, where the formal draft statutes were developed establishing the "International Cartographic Association."

This chain of events led to the First General Assembly of the new Association held in Paris, France, from May 29 to June 3, 1961, which was attended by representatives of 29 national cartographic organizations and societies.

The French Committee on Cartographic Techniques, under direction of M. R. Brunotte, S. de Brommer, and G. Guyonnaud, was host to the ICA First General Assembly and should be commended for the wonderful manner in which it administered these meetings.

A draft of the Statutes governing the organization was submitted, for discussion and final adoption, to the delegates from the original thirteen nations who attended the organization meeting held in Bern, Switzerland, in 1959.

Under the above rules for admission, the American Congress on Surveying and Mapping was designated the official organization representing cartographic activities in the United States. Action was taken by the ACSM Board of Directors at its meeting held May 16, 1959, giving approval to assume this responsibility and the appointment of Mr. Duncan Fitchet as the first ACSM delegate to this new organization.

The aims of the International Cartographic Association are as follows:

(a) The advancement of the study of cartographic problems. It is concerned with the source material, compilation, graphic design, drawing, scribing, and reproduction techniques of maps and associated forms of graphic representation. To this end, cooperation with different branches of geodetic, geographic, and other scientific research is desirable.

(b) The instigation and coordination of cartographic research involving cooperation between different nations, the exchange of ideas, the furtherance of training in cartography, and the encouragement of the spreading of cartographic knowledge.

(c) The organization of cartographical conferences, meetings and international exhibitions, etc., and participation in similar meetings organized by other scientific bodies.

(d) Between technical conferences, to work at problems of particular interest by the establishment of special commissions.

National Representation and rules for admission are:

Any nation which pursues an independent cartographic activity can be accepted as a member of the ICA provided that it agrees to participate financially in supporting the Association and in collaborating actively in its scientific and technical work.

Each nation can only be represented as a member of one single organization which should preferably be the national committee or society for cartography. Individual persons cannot be admitted as members.

Application for membership shall be made by letter to the Secretary-Treasurer and may be approved by the Executive Committee subject to ratification at the next General Assembly of Delegates.

The official organization of the Association consists of:

(1) The General Assembly of the Delegates, which is formed from the Executive Committee and the principal delegates of each member nation and their deputies who are able to attend.

(2) The Executive Committee includes the President of the Association, five Vice Presidents, and a Secretary-Treasurer.

The Executive Committee (1961–1964) includes the following members: *President*—

(*Continued on page 474.*)

Utilization of the Kilmsch Variomat in Map Compilation

By FREDERICK K. HAYES

ARMY MAP SERVICE

ONE of the major problems encountered when compiling small-scale maps from large-scale topographic base maps is the correct, yet generalized, portrayal of relief. It is necessary to depict, commensurate with the final compilation scale, the required contour interval. Character of the land forms should be retained without coalescence of contour lines. Likewise, the correct position of each contour must be maintained in relation to planimetric features despite any reduction in scale.

To achieve this end in map compilation the Army Map Service employs several methods.

1. When legibility permits, the base source is reduced photographically to the final compilation scale. The relief is then delineated by inking or engraving, according to specifications. The manuscript may be compilation separated or all colors shown on one copy.

2. Figure 1 shows a 1:25,000-scale source which due to coalescence of contour lines becomes illegible upon reduction. To overcome this problem, two methods are available.

a. "Pullups" are prepared by extracting or "pulling up" on an overlay the desired contours and planimetric features. Data are inked or pencilled allowing for enlargement of symbols and displacement of detail essential for insuring photographic reduction of each pullup.

b. By utilizing the Klimsch Variomat. The Variomat, manufactured by Klimsch West Germany, has proved an excellent assist in the preparation of relief copy. This instrument is adapted to fit the lensboards of most horizontal, process cameras if they utilize a strong camera base and lensholder. It is not the intent of this paper to describe in detail the functions and components of the Variomat. However, a brief explanation of its performance may help to clarify the application to contour presentation.

FIGURE 1. DIRECT REDUCTION OF A 1:25,000 SCALE RELIEF TO 1:250,000 SCALE.

Basically, the Variomat is a device which oscillates a glass disk interposed before the camera lens. An electric drive, in connection with a gear system and interchangeable lobed cams, causes this disk to both wobble and rotate during exposure. This action produces the same determinable effect as if the original copy were being moved. Varying amounts of displacement are obtained by inserting various sized cams.

Figure 2 shows an over-all view of the principal parts of the Variomat.

Figure 3 is a diagrammatic sketch of the relationship of Variomat parts to the camera lens.

Since light exposes photographic film, the areas where the light strikes during this displacement increases line weights if a

Presented at the 21st Annual Meeting of the American Congress on Surveying and Mapping, Washington, D. C., March 22–24, 1961.

negative copy is used. Conversely, positive copy decreases line weights as the reflected light from the background creates thinner lines.

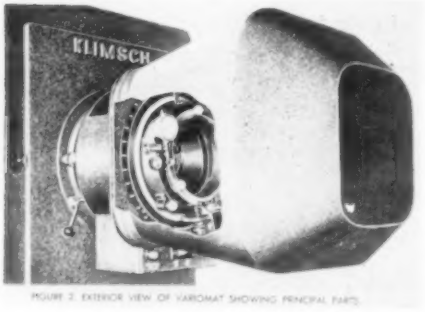

FIGURE 2. EXTERIOR VIEW OF VARIOMAT SHOWING PRINCIPAL PARTS.

This AMS application of the Variomat employs one of the original intents for which this instrument was designed, line variation. By the variation of the width or weight of lines, the desired index contours on the larger scale base are retained while the intermediates are faded out. A point of interest here is the fact that the amount of increase or decrease is from the outer edges of the line. Hence different width lines do not change in position.

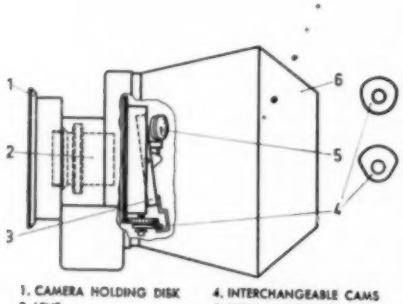

FIGURE 3. DIAGRAMMATIC SKETCH OF THE VARIOMAT.

Figure 4 depicts the elimination of intermediate contours leaving only index lines. For example, an AMS 1:25,000 or 1:50,000 scale map shows index contours by a line weight of 0.01″, intermediates at

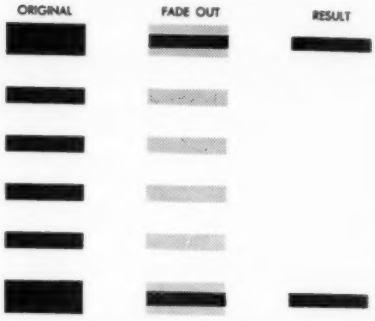

FIGURE 4. ELIMINATION OF INTERMEDIATE CONTOURS BY THE VARIOMAT

0.006″. By setting the Variomat to fade out or slim down all lines by 0.0065″, all intermediates are eliminated. The remaining index contours then approximate 0.004″. This line is adequately visible for photographic purposes or preparation of a drafting image. A reduction as great as ten times is possible with the Variomat. It may, however, be necessary to make it in two stages; for instance, using a relief positive of 1:25,000 scale, fadeout intermediates at 1:100,000. Then, employing the resultant negative, heavy up the remaining index contours before reducing the 1:100,000 to 1:250,000 scale. (Figure 5.)

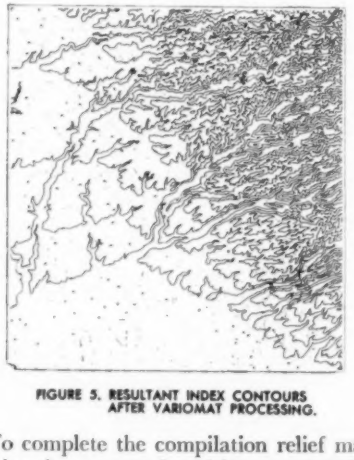

FIGURE 5. RESULTANT INDEX CONTOURS AFTER VARIOMAT PROCESSING.

To complete the compilation relief manuscript the processed positives are panelled to an image of the projection. This panel serves as the relief copy. At the time of

final engraving any additional minor generalizations needed can be made for compatibility with scale specifications. This ability to photographically present at a smaller scale the detailed contouring of a larger-scale map has been particularly appealing to cartographers interested in retaining such intensive contour delination.

The system is applicable primarily to the preparation of 1:100,000, 1:250,000, and 1:1,000,000 scale maps. Its use, naturally, is limited to sheets where the contour interval of the base source is readily convertible to the interval of the new map. Specifically, a 1:25,000 map with an interval of 10 meters carries index contours at fifty-meter intervals. Therefore, by fading out the intermediate tens, the fifties become intermediates for a fifty-meter interval on a 1:250,000 scale. (Figure 5.)

An illustration of possible monetary savings that can be achieved is offered by a 1:250,000-scale compilation. This map is composed of 32 1:50,000 base sources. At ten hours-per source for pulling up dense relief 320 man-hours are needed. No edit or correction time is included. The Variomat employs two hours per 1:50,000 totaling 64 man-hours. At recent AMS hourly rates a comparison of costs shows:

1. By pullup	320 @	$3.90 =	$1248.00
2. By Variomat	64 @	$6.50 =	416.00
		Savings	$ 832.00

Advantages of the Variomat include:

1. Possibility of direct engraving of contours without previous costly compilation delineation.
2. Direct presentation of existing relief at reduced scale.
3. Major curtailment of editing and correction costs.
4. Reduction of labor costs and elapsed time.

Disadvantages to consider are:

1. Color-separated reproduction copy is necessary.
2. Uniform line weights are essential.
3. Method is limited to direct conversion of index contours on base to required interval on smaller-scale map.
4. Supplementary contours are lost.

Despite these disadvantages the presentation of relief with the Variomat has been a decided asset to the Army Map Service by cutting compilation production costs while maintaining and improving quality standards.

Improved Curricula for Land Surveyors Endorsed by A.S.C.E.*

For several years the subject of up-grading curricula for land surveyors has been under study by ASCE committees. At its Phoenix meeting the Board of Direction considered a recommendation of the ASCE Committee on Engineering Education with regard to instruction in surveying in the accreditation of civil engineering curricula. It was voted to adopt as Society policy the recommendations advanced and to implement them through the Engineers' Council for Professional Development.

The policies for accrediting curricula are as follows:

"1. Civil engineering faculties should be encouraged to provide appropriate instruction in surveying by qualified personnel.

"2. Some of the engineering schools throughout the country should provide an elective sequence of surveying and mapping subjects that would comprise, in effect, an undergraduate major in survey engineering (or geodetic engineering or geometronic engineering).

"3. That some engineering schools should offer graduate-degree programs in major specialties of the survey engineering field, such as: land surveying, geodetic, cartographic, and photogrammetric engineering.

"4. That all employers of professional-level surveying and mapping personnel be encouraged to assist those schools that are willing to establish the educational programs listed in (2) and (3) above, by recommending promising students for enrollment, by offering part-time employment to students, by providing funds for scholarships and assistantships, and by employing graduates of such programs."

*Reprinted from *Civil Engineering*, June 1961, page 44.

LIETZ

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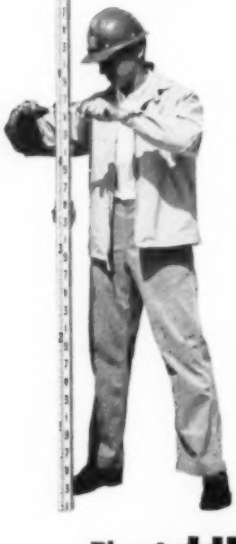

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Colonel Robert C. Miller Heads Army Map Service

As noted briefly in SURVEYING AND MAPPING, September 1961, Colonel Robert C. Miller has succeeded Colonel F. O. Diercks as Commanding Officer of the Army Map Service in Washington, D. C., Colonel Diercks having been assigned to new duties under the Assistant Chief of Staff for Intelligence, Department of the Army.

Colonel Miller has a broad understanding of the mapping and intelligence field, which has been his special area of responsibility since his graduation from West Point in 1937. Commissioned into the Corps of Engineers at that time, he has occupied successively more demanding posts, with pauses between his major tours of duty to augment his military and civilian schooling. Thus in 1940–41 he attended the University of California and received his Master of Science Degree in civil engineering. From 1948 to 1949 he was a student at the Command and General Staff College, Fort Leavenworth, Kansas, and, in 1953, attended a Joint Operations Course, Armed Forces Staff College, Norfolk, Virginia.

Colonel Miller's duty assignments have taken him to Europe, North Africa, the Far East, and the Caribbean area. Among other posts, especially notable ones, were Chief, Administrative Division, Army Map Service; assignment in the Military Intelligence Division, Office, Chief of Engineers (1945–46); Director of the Inter American Geodetic Survey (1952–53); Chief, Engineer Intelligence Division, Office, Chief of Engineers (1953–1957); Chief, Project Vanguard Task Force, Army Map Service in 1957; and assignment in 1958 to U. S. Army Forces Far East as Chief, Intelligence Division, responsible for policy guidance and staff supervision of theatre mapping and intelligence programs in the Pacific Command area.

He has now assumed command of the world's largest and foremost mapping agency, whose global operations are attested by working agreements with over 50 nations, and its activities range from topographic mapping, engineer intelligence studies and the collection of geodetic data, to maintenance of the world's largest topographic map library and the preparation of technical and logistical studies affecting the engineer portions of master war plans.

Surveying Alaska's State Lands

By LEO M. PETERSEN

ALASKA DIVISION OF LANDS

ALTHOUGH the subject of my discussion this evening is the participation by Alaska registered land surveyors in the subdivisional survey of State lands, I believe that first we should take a look at the prospective nature and extent of these State lands which may be subject to survey.

As you are aware, the State of Alaska is entitled under the Statehood and other Acts of Congress to select from the Federal Public Domain about 105 million acres broken down as follows: 102½ million acres under the General Statehood Grant, 1 million acres under the Mental Health Grant, 400,000 acres from the National Forest for community expansion and recreational use, and 400,000 acres from the Public Domain for the same purposes.

These grants are in addition to the special grant of 100,000 acres made for the benefit of the University, and about 106,000 acres of "School" lands, Sections 16 and 36 from each Township, which were set aside as the land was surveyed prior to Statehood. Also, this is in addition to the tidelands and submerged lands and the bottoms of inland navigable waters, title to which passed to the State also. How much land is this? Not counting the tide and submerged lands, and shorelands, which may aggregate as much as 100 million acres, it is an area larger than the entire State of California. It comprises about one-third of the total area of the State of Alaska. The other two-thirds will remain in Federal ownership and will be subject to use under Federal laws and regulations.

Can we select land anywhere in the State? We can select any land that we consider worth selecting from any unreserved land south and east of the Porcupine, Yukon and Kuskokwim Rivers—"The PYK Line." That means all land lying outside of national forests, national parks, national wildlife refuges, military reserves, or private land claims is open to selection.

Are there 105 million acres worth selecting? And do we have to select it all? No, we do not have to select it all or any of it unless we believe it will serve the best interests of the State. It also appears unlikely that there are 105 million acres south and east of the PYK Line which are worth selection. Our first estimates indicate that there may be as much as 95 million acres in this selection area, excluding the mountains and glaciers. However, we may make selections in the area North of the "PYK Line" if we get presidential approval. As I indicated above, we may select a limited area (400,000 acres) for community growth and recreational purposes from the national forests. We may also ask that land be restored from its reserved status and thus be made available for selection if it is no longer needed by the agency which requested the withdrawal.

What policies guide the selection of land? (1) We select those lands which will further the economic development of the State. (2) We select lands which will pay for themselves, which will prove to be a valuable asset and will thus serve to help support the State government.

The Statehood Act and Federal regulations require that the land must be selected in tracts of not less than 5,760 acres, unless isolated, so, in any selection, there may be considerable acreage of apparently worthless land. It is unreasonable, therefore, to assume that all the lands selected will have economic use in private ownership.

The Statehood Act requires that the Federal Government survey the exterior boundaries of each tract of land selected. We have insisted on the application of this principle and have made our selections in half-township units with the expectation of receiving a survey of the exterior boundary

Presented at the Annual Meeting of the Alaska Society of Professional Land Surveyors, Anchorage, Alaska, March 18, 1961.

of each half-township. This is not like having a surveyed line around every section as has been the case in the other States. But, it does mean that anywhere within a selection we would be reasonably close to an established corner monument on the boundary of the acreage selected by the State. Such a survey program may be sufficient for the more extensive land management activities for a long time to come, except in the event of sales of State lands where subdivisional surveys will be necessary, and which I shall discuss shortly.

Our basic principle is to select land where there are some specific needs to be met, either in sight or that we should be looking ahead to, and, with this in mind, we have filed to date with the Federal Bureau of Land Management, selection applications on approximately seven million acres. Full patent has been received on approximately seventy thousand acres and tentative approval issued on approximately one million acres. Tentative approval means that the State has been given conditional title, pending survey, to the lands described in the documents. Full patent will not issue until these parcels have been cadastrally surveyed by the Bureau of Land Management. Any transaction that may be considered by the State within an area of tentative approval would necessarily have to be conditional in nature.

At this point I think we should explore a bit the extent of cadastral surveys already accomplished by BLM and the job that lies ahead for the bureau. To date this Federal agency has surveyed a total of about three million acres in Alaska in parcels suitable for disposal. A lion's share of this has passed to private ownership and is not, of course, available for State selection. Therefore, it can be conservatively estimated that well over 90 percent of the total land entitlement of the State has yet to be surveyed by the Federal Government before the State may receive full patent. With such a staggering work load ahead I am sure that the BLM may be expected to employ every surveying technique that holds any assurance of being of value. Such techniques and methods will doubtless include full application of the sciences of photogrammetry and electronics. Although I am not now informed as to the details of the BLM plans for survey, I would hope that consideration is given to obtaining facilitating professional services by contract with private engineers and surveyors.

After the selected lands have been cadastrally surveyed by the Federal Government and patent issues to the State, we will first classify the lands for highest and best use. This classification provision is required by State law and the regulations of the Alaska Division of Lands. After classification the lands will be considered for disposal, either by lease or sale, and at that time it will be necessary to consider the needs for additional subdivisional surveys. The density and nature of these will depend on the use for which the land has been classified. It is the policy of the Division of Lands, that these additional subdivisional surveys will be executed largely by contract with the Alaskan professionals who are registered to execute land surveys in the State. We intend to keep our own cadastral engineering staff to the minimum required to handle comparatively small subdivisional jobs that arise on short notice and to prepare survey specifications, draft and negotiate contracts, and inspect the work of the contractors.

Our Cadastral Engineering Branch also has the responsibility of preparing protraction diagrams by projecting the public land township survey grid on the most reliable topographic mapping available. These are being made to furnish proper identification of areas to be selected, disposed of, or administered, and also to supply the basis for our official land records. While the use of these protraction diagrams is probably best known to you in connection with oil and gas leasing, they also will be of value in connection with survey of uplands, tidelands, and submerged lands. From the foregoing it should be apparent to you that the professional land surveyor in Alaska may expect to participate increasingly in the land survey program of the State. These surveys will fall into a number of classes. There will be the survey of land into lots

and blocks such as are encountered in and near municipalities, subdivisional surveys of land into larger parcels, and surveys of tidelands to accommodate various types of applications. At present, such participation may be comparatively modest but as the Federal Government increases the rate of issuing patents, the need for additional surveys by the State will surely become more extensive, and we will welcome your cooperation.

The matter of participating in the survey of tidelands for municipalities may be of especial interest to the professional land surveyors in Alaska. As you know, Paragraph 3 of Section 5, Chapter 169 of the 1959 Session Laws of Alaska, sets forth the general provisions which municipal corporations must follow to obtain title to tidelands fronting the municipality. Among these provisions is the requirement that the municipal corporation shall prepare an official subdivision plat of the area which, of course, would be obtained through the services of a qualified surveyor. It seems that some of our smaller municipalities have discovered that in their precarious financial condition they are unable to meet the costs required for conveyance of the tidelands, and to alleviate the situation Senate Bill No. 10 has been introduced in the present session of the legislature, which would amend Chapter 169, SLA 1959, and provide that a special fund be established, in an amount to be determined from time to time by the legislature, to facilitate such conveyance of tidelands. The municipal corporation would make application to the Division of Lands for a survey, with its cost and expense to be repaid by the municipal corporation to the fund following issuance of patent. The Division would expect to contract for such surveys with private surveyors. I believe this proposed legislation merits your attention, as passage of it will have an effect on your activities. It appears that this approach should provide a method whereby our relatively impoverished municipalities may obtain the tidelands to which they are entitled. I have with me copies of this Bill which will be made available to you if desired.

It is our hope that this plan of utilizing the services of private surveyors and engineers will mutually advance the science of surveying to groups or societies such as yours, and also to those surveyors who may reside in places remote from the more populated centers. For instance, we would be pleased to know that wherever State surveys are required in Alaska there would be a competent, private surveyor in the general vicinity, with whom we could contract to perform the work and with complete reliance in his performance and in his personal interest in the orderly development of that particular vicinity. We are convinced that these procedures will benefit both the State and the individual with respect to the transfer of title to real estate.

Through your participation you will leave your brand on the land. The adequacy, permanence, and exactness of your work will always be known by those who own the land you have surveyed. It is indeed an inspiring challenge to all of us.

If, at any time, you have questions concerning our programs and schedules, we should be pleased to discuss these matters with you. Our offices at 344 Sixth Avenue are open to you at any time. You will be most welcome.

New Publication Schedule for "Photogrammetric Engineering"

Photogrammetric Engineering, the journal of the American Society of Photogrammetry, will be published six times a year, instead of five as before, beginning in 1963. The five issues for 1962 are scheduled for March, May, July, September, and November. Regular bi-monthly publication will then continue.

(*Continued from page 466.*)

Professor Dr. Eduard Imhof, Switzerland; *Vice Presidents*—Granville K. Emminizer, United States; M. Stephane de Brommer, France; Brigadier B. D. O. Thackwell, Great Britain; Colonel Carlo Traversi, Italy; Dr. Carl M.son Mannerfelt, Sweden; and *Secretary-Treasurer*—Professor Dr. Erwin Gigas, Germany.

During the business sessions of this First General Assembly, thirteen nations were voted into the ICA, bringing the membership to 26—Austria, Belgium, Brazil, Canada, England, Finland, France, Germany, Greece, India, Iran, Ireland, Israel, Italy, Japan, Luxembourg, Malayan Republic, Morocco, Netherlands, Norway, Peru, Portugal, Spain, Sweden, Switzerland and United States.

Discussions were held relative to the incorporation of this organization into an existing international scientific organization. This question will be formally discussed at the IGU (International Geographic Union) and the ICA (International Cartographic Association) meetings to be held in London, England in July 1964. At that time it will be decided if the ICA will become affiliated with the IGU.

The General Assembly decided that a Scientific and Technical Conference on Applied Cartography will be held in Frankfurt, Germany in September 1962 (exact dates to be announced later). The organization of this Technical Conference will be under the direction of Dr. Erwin Gigas. President Professor Dr. Eduard Imhof announced that invitations will be sent to representatives of all nations who may be interested in attending these meetings.

—G. K. Emminizer, Jr.

The Old Order Changeth, Giving Place to the New.

From *The Australian Surveyor*, September 1960, Vol. 18, No. 3, page 152, we quote the following brief editorial. We attended the summer surveying camp of Cornell University, if our memory serves us correctly, in the summer of 1913. The following year a young lady, registered, we believe, as a Forestry student, attended the camp and quite successfully held up her end of the work throughout the six-weeks camp in the days when transportation, covering a lot of territory, was by "shanks mare" and nobody had ever heard of the modern, light-weight instruments. —Editor.

Women in Our Ranks? No!—Never!

A paragraph, under the above heading, appeared in "The Surveyor" of 11th April, 1893. It made reference to the first two women who had just graduated, with credit, in Medicine, from the University of Sydney. It also referred to the immunity of the surveying profession from any invasion by women into its ranks. Wonder was expressed whether the time was far distant when the Survey Lecture Room at the University would be crowded with "sweet girl graduates" eager to learn professional intricacies from the genial lecturer, or the Board examining in License to Survey would feel impelled to report that some members of the fair sex had "passed with credit." The chivalrous gentlemen of that day hoped that they would not live to see a female surveyor shouldering her theodolite up a steep hill on a hot day.

Now in the year 1960, we have to report the entry of the first lady student into the surveying profession in Australia. The news came obscurely from the Victoria Division recently. We feel, however, that it is worthy of special mention, and the Victorian Secretary has kindly sent us some details.

Our new student is Miss E. C. K. Gardonyi of Hawthorne, Melbourne. Her qualifications, "Licensed Surveyor (Hungary)." She matriculated from the Hungary University in Maths I, II, III, IV, Physics I, II, Chemistry, Geodesy I, II, Drawing, Descriptive Geometry I, II, Geology, Mineralogy and completed a three years University Course in Land and Mines Surveying. She became a licensed surveyor in Hungary in July 1952, having trained in the Dept. of Lands and Dept. of Mines. Her professional experience covers town, topographical, cadastral and mining surveying, geodetic computations and map drawing. From the Royal Melbourne Technical College she has gained Computations B, Aerial Surveying and Photogrammetry, Geodesy, and Astronomy. Present appointment is with the Dept. of National Development, Bureau of Mineral Resources, engaged in geophysical computations.

We wish our new entrant success in the attainment of qualifications in Australia and a happy and successful career in the profession of surveying in this country. —Editors

Surveys for Bureau of Reclamation Planning

By ARTHUR F. JOHNSON*

BUREAU OF RECLAMATION

ABSTRACT: The Bureau of Reclamation, in planning water resource developments for irrigation and associated purposes, requires maps and surveys of varying degrees of detail and accuracy appropriate to a wide range of topographic conditions and to the stage of the investigation. These include topography of arable land areas, reservoirs and structural sites; alignment for canals, transmission lines, access roads and relocations of railroads, highways and utilities; channel cross sections and profiles; and cadastral and rights-of-way surveys. Methods are varied to the situation with economic use of both established field procedures and modern advances in photogrammetry and electronic devices. Survey schedules are established to best use the facilities of national survey and mapping agencies, Bureau of Reclamation personnel, and engineering firms under contract.

THE Bureau of Reclamation, of the United States Department of the Interior, has responsibility under the Federal Reclamation Laws, (Act of June 17, 1902, and Acts amendatory thereof and supplementary thereto), for the development of land and water resources of the 17 "reclamation" States of the West, designated by law, and for investigations of water resources in Alaska. Prerequisite to development, extensive investigations must be made. These include surveying and mapping, geological explorations, hydrologic studies, land classification, agricultural economic studies, preliminary designs and cost estimates, and reports. These activities are financed by Congressional appropriations from the revolving Reclamation Fund and from the General Fund. Under this program the Bureau of Reclamation has constructed works to supply some seven million acres of land with a full or supplemental irrigation water supply.

While the original and still the basic function of the Bureau of Reclamation is the irrigation of arid lands of the West, the scope of development now includes the multiple-purpose functions of drainage of irrigated land, flood control, hydroelectric power, river regulation, municipal and industrial water supplies, fish and wildlife conservation, abatement of stream pollution, recreation, and sediment control. Some of these purposes are primary responsibilities of other Federal and State agencies but are included to achieve balanced resource development and the economies of construction to optimum magnitude and joint use.

The Bureau of Reclamation cooperates with the affected agencies in plan development, utilizing their skills and experience. The requirement for maps and surveys, as for other basic data, is supplied not by the Bureau of Reclamation alone, but by the other agencies whose function it is to collect, process, and publish such data.

RELATION OF SURVEYING AND MAPPING TO INVESTIGATIONS

Some of the relationships of surveys and maps to the several investigation activities are discussed below.

1. *Land Classification.* Topography is an element in the Bureau's economic land classification. The general slope of the land in direction and amount determines its suitability for irrigation, as it governs the design of structures for conveyance and distribution of water, the preparation of the land for irrigation, and the cost of labor and equipment in applying water to crops. The delineation of the boundaries of various land classes and subclasses is commonly done by planetable methods. The boundaries and designations are usually made on rectified,

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vertical photographs of the area on double-weight, semi-matte paper prepared so as to show one section (one square mile) to the sheet, with marginal area provided for logs of borings showing the various soil horizons, their structural and chemical identifications, and other notes. Photo identification assists the classifier in delineation and classification and greatly reduces the amount of field surveying needed. Topographic maps to the same scale as the photographs, prepared on transparent, dimensionally stable, plastic overlays, provide topographic data and planimetric identification.

2. *Designs and Quantity Estimates.* Topography, plans, profiles, and cross sections form the basis for preliminary designs and estimates. The same topography used in land classification is used in paper locations of canals, lateral distribution systems, and drains. Where topographic coverage is not available, supplemental strip topography or more often stadia traverses with cross slopes provide alignment data. Similarly, reservoir site topography is basic to determining area and capacity relationships, to elevation essential to water-supply operation studies, and selection of optimum heights of dams to impound storage for the various purposes to be served. Also involved are the paper location of access roads or the relocation of highways, railroads, and utilities; the rights of way to be purchased; etc. Topography at dam, tunnel-portal, siphon, and other principal structural sites is needed for the design layout at those sites and the mapping of their geologic features.

3. *Hydrologic Studies.* Aside from reservoir topography, previously mentioned, watershed topography is needed to evaluate flood potentials for design of spillways and cross-drainage structures and channels. River cross sections are essential in the computation of channel capacities, backwater and tailwater curves, and sedimentation studies. River profiles assist in selecting power sites. Land classification maps aid in establishing canal and lateral capacities to serve irrigable land.

4. *Property.* Land surveys, including cadastral resurveys, are essential, both in the settlement of new project areas, to establish farm-unit boundaries, and in the acquisition of rights of way and easements for construction and operation.

SURVEYING AND MAPPING REQUIREMENTS BY STAGES

Bureau of Reclamation investigations fall into three principal stages, although the lines between them are not always strictly drawn. These stages are established by program definition, and deviations in physical criteria must frequently be accepted in order to comply with fiscal and time limits. These stages are: Reconnaissance, Feasibility, and Preconstruction. The reconnaissance stage is a preliminary one for a rough evaluation of potentialities for development for program purposes, to determine whether or not detailed investigations are currently justified. The feasibility stage is the comprehensive study of the project—in such detail as to fix within relatively close limits the plan, size, and purposes of the project; its cost, benefits, and possibility of repayment by its beneficiaries—to support its authorization by the Congress for construction. The preconstruction stage supplements deficient feasibility-stage data and provides additional data required by law, or essential to an administrative decision to request funds to start construction. This stage actually continues after appropriation of construction funds into the investigations preliminary to the preparation of construction designs, specifications, and the engineer's estimate of cost, prior to actual construction, in a transition from planning to construction organization responsibility. Surveying and mapping criteria relate to these stages in respect to order of accuracy and method of accomplishment.

RECONNAISSANCE STAGE REQUIREMENTS

To the extent possible, reconnaissance investigations use available maps; the 7½ and 15-minute quadrangle maps of the Geological Survey or Army Map Service are excellent for this purpose. Surveys to supplement them or substitute for them are of low grade, both as to detail and relative accuracy. Land areas to a scale of 1:12,000

with a 5-foot contour interval may be obtained if there are no acceptable maps. Reservoir surveys may consist of a few cross sections from a prinicipal traverse, with shots taken by stadia distance and vertical angle, or of sparse shots on a planetable. A profile will substitute for damsite topography. Canal alignment surveys are restricted to stadia fly lines having horizontal angles, with levels perhaps limited to altimeter readings at critical points. Land classes may be delineated largely from interpretation of aerial photographs or from a limited number of strips with a correspondingly smaller number of borings per square mile. Sampling techniques are frequently used. The entire effort is to apply judgment to limited data to eliminate inferior alternatives and define the features justifying detailed surveys.

FEASIBILITY STAGE REQUIREMENTS

1. *Land Areas.* Topographic maps for irrigation service areas used for land classification and distribution and drainage system layout are normally drawn to a scale of 1:4,800 with a contour interval of 2 feet; in steeper areas the contour interval may be 5 feet. One-foot contours are desirable on very flat areas, but surveys in this detail are expensive, however performed. Third-order control is required, and the usual requirement is that 90 percent of all contours be accurate within one-half a contour interval and all contours within one contour interval.

Reservoir Sites. Scales and contour intervals vary with the size of the reservoir and the accuracy of the capacities desired. State filing regulations specifying certain scales or contours, or even a high waterline traverse, are complied with. Small reservoirs, up to about 50,000 acre-feet, are commonly mapped at a scale of 1:4,800 with a 5-foot contour interval; on larger reservoirs, up to perhaps 100,000 acre-feet, a scale of 1:12,000 with a contour interval of 10 feet is used; Large reservoirs can be satisfactorily defined at a scale of 1:24,000 with a 10-foot contour interval, or even a 20-foot contour interval if the height of dam is appreciably over 200 feet.

Damsites. A scale of 1:600 and contour interval of 2 feet are ordinarily used, but on the wide flat sites of the Great Plains the scale is reduced to 1:1,200 or 1:2,400, and for large, high dams a 5-foot contour interval is acceptable. Drafting table size limits the workable scale. Such maps must extend to powerplant and switchyard sites, working areas, camp or townsites, borrow pits, and channel areas needed for computing tailwater curves.

Other Structures. Pumping plant sites, siphon locations, tunnel portals, buildings, and other structure sites are mapped to a scale of 1:600 or 1:1,200, with contour intervals of 2 or 5 feet, depending upon the size of the working area and its relief.

Canals. Scales of 1:4,800, with contour intervals of 2 or 5 feet, corresponding to land-area topography, are commonly used for small canals. For principal canals or for reaches where special sections may be used, plan and profile scales of 1:2,400 or even 1:1,200, horizontal, and 1:120, vertical, are desirable, especially where the same data may be used in design or specifications later.

Drains. The usual mapping requirements for canals and laterals apply to drains, except that for purpose of analysis groundwater data are added to topographic maps.

Transmission Lines. Field surveys are not generally made for feasibility estimates, as alignments depend upon selecting principal substation locations near load centers, and published maps are usually satisfactory for this purpose.

Miscellaneous. Survey requirements for roads and railroads are generally similar to those for canals. River sections for tailwater purposes may be surveyed as cross sections from a traverse or may be extensions of damsite topography. Scales of 1:600 to 1:2,400 and contour intervals of 2 or 5 feet, depending on relief, are satisfactory for tailwater and backwater studies, but for sediment ranges to be resurveyed at intervals, cross-section profiles should be accurate at all points within 0.5 foot. Right-of-way surveys are not generally made in feasibility investigations, but areas are estimated from feature maps or for reser-

voirs and damsites, based on acquisition of property to the nearest 10-acre subdivision.

PRECONSTRUCTION STAGE REQUIREMENTS

Topographic maps prepared during feasibility-stage investigations are satisfactory for most preconstruction purposes, but it is customary to make field alignment surveys and prepare plans and profiles for canals, laterals, drains, channel improvements, roads and railroads, pipelines, etc. These are ordinarily to a scale of 1:2,400, horizontal, and 1:120, vertical, and contour intervals are 2 feet. Cross-section data are now commonly placed on punch cards together with design data for electronic computer processing.

Transmission lines are an exception to usual feasibility practice in that all field work is done after authorization. A reconnaissance is made, generally by air, with a field inspection where more detail is needed. A preliminary alignment is mapped with the aid of aerial photographs and existing communication and transmission line detail added for inductive interference studies. Field surveys are then made by transit-and-tape traverse, with ties to section corners, and a profile is prepared. A special feature of the profile is the ground clearance of all existing telephone, telegraph, and power lines at points of intersection. Structure sites are determined by office studies and field checked.

WORK SCHEDULING

Federal budgetary processes require programming of investigations by years and dollars for seven years in advance. These programs are brought up to date each year, and the current years' program is presented in essential detail to show for what purpose funds are requested. It is, therefore, necessary to anticipate surveying and mapping needs several years in advance of performing the work.

This is particularly true with respect to the national mapping program. The Bureau of Reclamation, along with other Federal and State agencies, anticipating need for small-scale topographic maps, makes those needs known and the requests are considered by the Interior Department Field Committee in developing the 7½-minute and 15-minute quadrangle map program of the Geological Survey. Bureau of Reclamation needs for first- or second-order horizontal and vertical control are considered by the Coast and Geodetic Survey in developing its program. Cadastral surveys for Bureau of Reclamation projects, including resurveys, similarly are programmed by the Bureau of Land Management. Where surveys and maps requested by the Bureau of Reclamation cannot be included in the national program for completion when needed, it is sometimes possible to expedite the programs of these agencies by transfer of Bureau of Reclamation general investigations funds to pay the increased costs. In some cases, the Bureau may itself perform such work as extension of triangulation and level control networks from established systems to areas of interest or perform cadastral work with the approval of the Bureau of Land Management. Mapping performed by the Bureau of Reclamation is made available to the Geological Survey for use in compiling new quadrangle maps or revising planimetric features of old ones.

Survey work to be performed by the field parties of the Bureau of Reclamation is carefully scheduled by dates and man-days and by cost, not only to support budgetary programs but to best utilize personnel and equipment throughout the working season to accomplish program goals. Thus, land topography must be completed ahead of land classification, and land classification before layout, design, and estimates for lateral distribution and drainage systems. Reservoir topography must precede water-supply operation studies. Structural site topography and geological maps must be available with other design data before designs and estimates can be performed, and these in turn must be available together with economic studies before financial analyses are made. The ideal is a uniform flow of work for all personnel, but when that cannot be achieved adjustments must be made.

Adjustments are made in several ways. Surveying methods are basically dependent on the nature of the work to be done but can frequently be adapted to utilize available personnel and equipment, or to conserve funds. Temporary employees may sometimes be recruited to meet an enlarged load, especially during the summer vacations of engineering students. If conditions are not favorable for recruiting, due to lack of applicants, the work can be done by contract. The Bureau of Reclamation has in recent years accomplished a major part of its topographic requirements by photogrammetric processes and under contract, thus eliminating at least a part of the difficulty of recruiting and maintaining survey parties and at the same time gaining the peculiar advantages of photogrammetry in accuracy, speed, and cost. Use of electronic, distance-measuring devices, self-leveling levels, improved theodolites, optical plummets, echo sounding devices, and other recently developed equipment has expedited and improved the work both of our own parties and that of our contractors. Bureau of Reclamation engineers welcome advances in the surveying profession, new equipment, new methods, and better training, to the end of achieving the individual requirements of each investigation by the most economical and expeditious means.

ACSM Educational Division's Regional Reference

Listing of Surveying and Mapping Educators in the U. S. by Areas

To cope with the many inquiries addressed to the ACSM for information relative to getting an education in the fields of surveying and mapping, ACSM's Division on Education has enlisted the cooperation of the following listed educators and schools to whom inquiries may be directed for information in their particular areas. Individuals and school counselors are invited to address their particular inquiries directly, or the ACSM will forward same to the strategically located point of area interest.

IDAHO, WASHINGTON, OREGON
Professor Elvin G. Ericson, Washington State University, Pullman, Washington

CALIFORNIA, NEVADA, HAWAII
Professor Francis H. Moffit, University of California, Civil Engineering Department, Berkeley 4, California

UTAH, ARIZONA
Professor Clifford Bryner, University of Utah, Salt Lake City, Utah

COLORADO, WYOMING, MONTANA
Professor Roland C. Rautenstrauss, University of Colorado, Boulder, Colorado

KANSAS, N. & S. DAKOTA, NEBRASKA
Professor John G. McEntyre, Kansas State University, Manhattan, Kansas

TEXAS, OKLAHOMA, NEW MEXICO, LOUISIANA
Professor Robert D. Turpin, Civil Engineering Department, University of Texas, Austin, Texas

WISCONSIN, MINNESOTA, IOWA
Professor Eldon C. Wagner, Civil Engineering Department, University of Wisconsin, Madison 6, Wisconsin

ILLINOIS, MISSOURI, ARKANSAS
Professor Winfield H. Eldridge, University of Illinois, Urbana, Illinois

INDIANA, TENNESSEE, KENTUCKY
Professor Kennth S. Curtis, Purdue University, Lafayette, Indiana

MICHIGAN, OHIO
Professor Ralph M. Berry, University of Michigan, Ann Arbor, Michigan

ALABAMA, MISSISSIPPI, GEORGIA, FLORIDA
Professor John O. Eichler, Georgia Institute of Technology, Atlanta, Georgia

N. & S. CAROLINA, VIRGINA, W. VIRGINA
Professor Michael V. Smirnoff, North Carolina State College, Raleigh, North Carolina

NEW JERSEY, DELAWARE, MARYLAND
Professor Paul P. Rice, Rutgers University, New Brunswick, New Jersey

PENNSYLVANIA
Professor Harmon A. Weeden, Pennsylvania State University, University Park, Pennsylvania

NEW YORK
Professor George B. Lyon, Cornell University, Ithaca, New York

NEW ENGLAND STATES
Professor Carl F. Meyer, Worcester Polytechnic Institute, Worcester, Massachusetts

Symposium on Land Erosion

Sponsored by the International Association of Hydrology, the Symposium on Land Erosion will be held in Bari, Italy, in October of 1962. It is expected that a number of participants from the United States will attend. The Section of Hydrology of the American Geophysical Union is encouraging workers in the field of erosion and sedimentation to present results of their investigations. The International Association has formulated three general subjects which will form the basis of the Symposium.

(1) Optional subjects in soil erosion, particularly fluvial morphology, transport of solids, soil erosion.

(2) Cartographic description of effects and factors of soil erosion; use of areal photography.

(3) Description of testing instruments; artificial sprinkling, soil humidity, measurement of bed load and suspended sediment, kinetic energy of rain, etc.

It is clear that these topics are sufficiently broad to include all aspects in the fields of erosion and sedimentation.

There will also be opportunities to visit experimental stations, and regions most subject to erosion, particularly the Appennines and southern Italy.

Informative abstracts of prospective contributions from the U.S.A. (not more than 250 words) should be submitted to the Chairman, Committee on Erosion and Sedimentation, not later than January 1, 1962. An anonymous screening committee will review the abstracts to assure material of high technical quality and authors of papers tentatively accepted will be notified. Manuscripts of completed papers should be submitted to the Chairman by April 1, 1962. It is expected that IAH will print and have the papers available prior to the meeting.

The AGU looks forward to active participation by workers throughout the field in the United States. Those interested should forward inquiries or abstracts to: Dr. M. Gordon Wolman, Chairman, Committee on Erosion and Sedimentation, AGU Section of Hydrology, Isaiah Bowman Department of Geography, The Johns Hopkins University, Baltimore 18, Maryland.

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Use of the Elevation Meter in Topographic Surveying[1]

By THOMAS C. BURGER

TOPOGRAPHIC DIVISION, U. S. GEOLOGICAL SURVEY[2]

ABSTRACT: The Elevation Meter is a device used to extend fourth-order, vertical control along road systems. Proper planning and careful operation of the meter produce satisfactory elevations. The use of the meter reduces the personnel and field time required for establishing supplemental control. The meter is particularly suited to certain conditions of terrain, and this factor affects the economy of the mapping operation.

THE Johnson Elevation Meter (Figure 1) is an electromechanical device which measures differences in elevation. Essentially, the meter consists of the following components:

FIGURE 1.—The Johnson Elevation Meter mounted in a carryall.

(1) A liquid-bath pendulum, suspended in a magnetic field, that measures the slope of the road traversed.

(2) A fifth wheel that precisely measures the distance traveled (Figure 2).

(3) A counter-computer system that integrates the factors of slope and distance and computes elevation in feet.

In addition to these basic components, the meter contains several unique features

FIGURE 2.—The fifth wheel that precisely measures the distance traveled.

to increase the accuracy of results, such as a controlled air system that keeps the vehicle tires at the same pressure regardless of variable heating; a pendulum heater that insures a constant density of the liquid surrounding the pendulum; and a power system totally separate from the automotive power system.

All the components are mounted in a carryall equipped with four-wheel drive and four-wheel steering. The resulting increased maneuverability permits normal operation in all but the most severe weather.

PERSONNEL

For maximum efficiency, the operation of the meter requires two men, a driver and an operator. The driver must be carefully trained to develop good driving habits, for obvious reasons of safety and for optimum results in accuracy and production. The driver is responsible for maintaining a con-

[1] Presented at the 21st Annual Meeting of the American Congress on Surveying and Mapping, Washington, D. C., March 22–24, 1961.

[2] Publication authorized by the Director, U. S. Geological Survey.

tinuing balance between speed of operation and smooth vehicle operation, regardless of road type or condition. The driver also reads aloud the numerical values on the counters for the operator to record (Figure 3).

FIGURE 3.—Counters mounted on dashboard of carryall.

The operator's duties include selecting the points for which elevations are desired, recording the distance and elevation data for each point, and checking the various gages and dials that indicate whether the equipment is functioning properly. In addition to these duties, the operator uses aerial photographs and existing maps to plan each day's running in advance. This planning includes selection of routes that produce a maximum number of usable elevations in a minimum of time, and the selection of suitable starting and tie points. Consideration must also be given to reducing the length of single-run lines to a minimum. Careful planning by an experienced operator can substantially reduce costs and increase the efficiency of operation of the meter. The importance of proper planning cannot be overemphasized.

OPERATIONAL PROCEDURE

As a vital preliminary to field operations, the operator investigates existing vertical control and transfers the control-point elevations to adjacent road features. This system provides a threefold advantage.

(1) It insures that lines will not be planned from vertical-control points that cannot be found.

(2) It reduces meter-operation time.

(3) It provides an opportunity for road reconnaissance in questionable areas.

The actual operation of the meter is a relatively simple procedure after the preliminary steps are completed.

Head the vehicle in the desired direction of running, with the fifth wheel over the starting point of known elevation. Check all gages to verify the proper functioning of meter components. Set the distance and elevation counters to zero.

Drive along the road to the first desired photopoint, stop the vehicle exactly at the point, and record the distance and elevation readings.

Continue along the road, stopping and recording at all desired points.

Proceed to the tie point of known elevation, record, and check for accuracy by inspection.

The speed of operation depends on road type and condition. On hard-surfaced roads, speeds up to 30 miles an hour are permissible. Secondary roads of poorer surface quality must be negotiated at the speed that transmits the least possible shock to the pendulum. Smooth vehicle operation is an absolute necessity for successful meter operation. In sectionized country, on various types of road surfaces, 50 to 60 linear miles of road can be traversed in a normal day's operation.

METHODS OF OPERATION

As the meter is a wheeled vehicle, it is restricted to roads, and the plan of operation depends on the available road pattern. In sectionized areas, with roads on all section lines, a single running of every road generally provides enough elevations for photogrammetric leveling of stereomodels. This blanket-coverage method has the added advantage of providing nearly all the elevations needed for the final map and substantially reducing planetable work in subsequent phases of fieldwork. Because the meter lines provide a relatively dense network of elevations, the leveling of stereomodels does not depend on a bare minimum of control points and is not influenced by an occasional point which does not fit the solution.

Traversing all the roads on a quadrangle produces a series of loop closures similar to those of conventional leveling. The error in each loop is found by adding algebraically the elevation increments between the junction points around the loop. The indicated error of closure is distributed by an analog, least-squares board that exactly relates loop closures and common distances to electrical currents and resistances. The adjustment needed to close all the loops to zero is simply read from a dial.

Experience has shown that the single-run method with least-squares adjustment of data is the most efficient means of extending fourth-order, vertical control with the meter, provided that the road pattern is suitable.

In areas of higher relief and fewer roads, each road should be double run to insure compliance with accuracy requirements. Double running consists of two single runnings of the same route in opposite directions. An average of the two elevations obtained for each point is considered the correct elevation. Double running eliminates the need for the least-squares adjustment because closure error is prorated back through the line according to the distance from the starting point. Although double running substantially increases the field-operation time per linear mile, there is no satisfactory alternative that can be used in areas of higher relief with fewer roads to provide cross-ties.

In extremely rugged terrain with few roads, it is questionable whether meter operation can compete with conventional planetable traverse or other standard methods of establishing supplemental control. However, a combination of double-run meter lines on the available roads and photogrammetric vertical bridging using the meter elevations is a possibility. Also, a combination of double-run meter lines and conventional planetable lines originating from meter elevations might prove advantageous. In this marginal type of terrain, the suitability of meter operations must be adjudged individually for every project.

ACCURACY

The accuracy of the meter depends primarily on proper calibration, road conditions, and the skill of the driver. Fourth-order, vertical-accuracy requirements can be met with careful operation. Assuming proper calibration, the accuracy of results is independent of the over-all relief measured in a line. Because fourth-order accuracy requirements are linked with the contour interval, these requirements are generally more easily met in areas of greater relief than in areas that require elevations to be correct within ± 1 foot. In areas to be compiled with a 10-foot contour interval, a least-squares adjustment of the data is necessary. Our experience shows that the meter does not determine elevations accurate enough for mapping at contour intervals of less than 10 feet.

A test of 412 meter elevations versus third-order, spirit-level elevations in an area to be compiled with a 20-foot contour interval indicated the following results:

80% of the elevations were correct within ± 1 foot.

99% of the elevations were correct within ± 2 feet.

Maximum error was 2.5 feet.

The data were obtained by a single running along third-order level lines. The meter lines were adjusted at 5-mile intervals to simulate normal meter operation and line adjustment.

A project in Kansas that had been supplementally controlled by the single-run method, with least-squares adjustment, was checked for accuracy of meter elevations. Seventy-five meter elevations were compared with elevations obtained by fourth-order stadia methods. Assuming the stadia elevations to be correct, 79% of the meter elevations were correct within ± 1 foot; 96% were correct within ± 2 feet, and the maximum error was 2.6 feet. These results closely parallel the findings of the first test but cannot be termed conclusive because the comparison elevations were obtained by fourth-order methods.

A third test of the meter was made in the vicinity of Fort Collins, Colorado, by fieldmen of the Rocky Mountain Area of

the Geological Survey. This test was made under ideal meter conditions, a smooth, oiled road paralleling a river grade. The line, approximately nine miles long, was adjusted at the ends and at the midpoint to simulate normal meter operation. The line was single run, and the test elevations were compared with Coast and Geodetic Survey bench-mark elevations.

Of the seven elevations tested, the average error was 0.3 foot, and the maximum error was 0.6 foot. The over-all difference in elevation from start to tie was 1,185 feet. It must be emphasized again that the line chosen was ideal for meter operation and that normal operation will not yield results of this quality.

The meter is definitely cost competitive with conventional methods of extending supplemental control. A project in eastern Kansas, consisting of sixteen 7½-minute quadrangles to be compiled with a 10-foot contour interval, was supplementally controlled for slightly under $2 a square mile. The single-run, least-squares-adjustment method was used on this project. All the public roads were traversed, and elevations were obtained at approximately half-mile intervals.

The cost of an adjacent project, consisting of five 7½-minute quadrangles in more rugged terrain along the Missouri River, was $6 a square mile. All the lines in this project were double run because of the rugged terrain, lack of cross-ties, and the poor quality of many of the roads. Part of the higher cost can be attributed to start-up costs, as this was the first project in the area.

A third and final project in the area was started but not completed because of time limitations. Five 7½-minute quadrangles to be compiled with a 10-foot contour interval were supplementally controlled at a cost of approximately $3 a square mile. The single-run, least-squares-adjustment method was also used on this partial project.

In a 15-week period, fourth-order, supplemental control was extended on twenty-six 7½-minute quadrangles or 1,436 square miles by two fieldmen and two assistants at an average cost of $3.50 a square mile. Cost of other projects will vary widely, of course, depending on personnel, project size, type of terrain, and other factors; but for areas suited to meter operation, there is little doubt that the meter can compete economically with conventional methods of extending fourth-order control.

FUTURE DEVELOPMENTS

The Topographic Division of the Geological Survey is currently awaiting the delivery of two new elevation meters that incorporate two major changes and several minor modifications suggested by the Geological Survey operators of the old meter.

The electronic circuitry has been simplified by the use of printed circuits and transistors. The main advantages are a reduction in power requirements for the system and a decrease in bulk and heating effects. Field repair of the meter should be simplified, as duplicate printed circuits are provided for replacement in the system should malfunctions occur.

The human-error element in recording will be eliminated by a paper-tape recording system that will record all the necessary data at a station with the push of a button. The tapes can be retained to provide a convenient record of all operations.

One of the minor modifications referred to will be of interest to fieldmen of the past and present—the vehicle is air conditioned for operator comfort. Air conditioning will also reduce the dust problem in the mechanical parts of the meter.

CONCLUSION

The meter definitely has a place in topographic mapping and is particularly suited to large projects of moderate relief with an adequate road system. Problems of scheduling, especially in marginal areas, require decisions as to feasibility on an individual basis. This instrument, with its mass-production possibilities, can release personnel for other projects and phases. In addition, meter operation is cost competitive with conventional methods of extending supplemental control.

From the viewpoint of a fieldman, the

meter eliminates much tedious, planetable traverse; it can be operated in bad weather; and, last but not least, it allows surveying in reasonable comfort.

It is hoped the new meters will produce elevations of greater accuracy than those obtained with the earlier model. A reduction in *down* time, due to the simplified electronic circuits, combined with the fast, automatic, recording system should increase productivity. We of the Geological Survey believe the meter offers a partial solution to the vexing problem of automating vertical control.

Dr. Gerlach Receives Geography Award

The Geography and Map Division of the Special Libraries Association presented its Honors Award at its Business Meeting on May 29, 1961, in San Francisco, to Dr. Arch C. Gerlach, Chief of the Map Division of the Library of Congress, for his significant contributions in the fields of geography and map librarianship.

For the past ten years, Dr. Gerlach has organized summer projects in the Map Division for promising young geography majors; he has encouraged his staff to compile map bibliographies for publication, to write articles, and present papers; and has himself prepared numerous map exhibits, lectured, and written papers on cartography and kindred subjects for professional journals. He has been a Visiting Professor of Geography at the University of Michigan, a Director of the Cartography Division of the American Congress on Surveying and Mapping, Chairman of the National Academy of Sciences–National Research Council Advisory Committee on Gegography for the Department of State, and the U. S. Representative on the Directing Council of the Pan American Institute of Geography and History. He is a member for the United States of the International Geographical Union Commission of Classification of Geographical Books and Maps and Editor of the *Professional Geographer*.

Dr. Gerlach received his B.A. in Geography from San Diego State College, his M.A. from the University of California at Los Angeles, and his Ph.D. from the University of Washington. Before joining the Library of Congress in 1950, Dr. Gerlach was Associate Professor of Geography at the University of Wisconsin. Previously he served as Cartographer and Geographer with the Office of Strategic Services, and as Acting Chief of the Division of Maps, Department of State.

In the Special Libraries Association, Dr. Gerlach has served as a Director on the Executive Board, Chairman of the Geography and Map Division, Director of the Washington, D. C. Chapter, and is Chairman of the forthcoming 1962 SLA Convention in Washington, D. C.

Other organizations of which he is a member include the American Geographical Society, Association of American Geographers, National Council of Geography Teachers, Association of Pacific Coast Geographers, and the American Congress on Surveying and Mapping.

One Title Officer to Another

Are you tired? Do you feel awful? Rundown? Overworked? Perhaps there is a reason why. We have run across some absolutely irrefutable statistics that show exactly why you are tired. And brother, it's no wonder you're tired. There aren't as many people actually working as you may have thought. At least, not according to this survey, recently completed.

The population of the country is 160 million, but there are 62 million over 60 years of age, leaving 98 million to do the work. People under 21 total 54 million, which leaves 44 million to do the work. Then, there are 21 million who are employed by the government, and that leaves 23 million to do the work. Ten million are in the armed forces, leaving 13 million to do the work. Deduct 12,800,000, the number in the State and city offices, and that leaves 200,000 to do the work. There are 126,000 in hospitals, insane asylums, and other mental institutions, and that leaves 74,000 people to do the work. But 62,000 of these are bums or vagrants who refuse to work, so that leaves 12,000 to do the job. Now, it may interest you to know that 11,998 people are in jail, so that leaves just two people to carry the whole load. That is you and me, pal, and I'm getting tired of doing everything myself.

Reprinted from *Title News*, Vol. XXXVII, No. 12, December 1958.

United Engineering Center

In September 1961, nineteen professional engineering groups opened their headquarters in the United Engineering Center, at 345 East Forty-seventh Street, New York 17, N. Y., thus bringing together under one roof the executive offices of societies representing a total of about 300,000 engineers. The building, which cost approximately $12 million, was financed largely through the contributions of individual engineers and substantial contributions from industry. Fund raising, as well as over-all planning and construction of the building, was handled by United Engineering Trustees, Inc., a control group established in 1904 to administer the old Engineering Societies Building, then in the planning stage, and which has since continued to control jointly owned and operated facilities such as the building and the Engineering Societies Library. Authority is vested in a board of fifteen members—three from each of the five Founder Societies.

The building is in keeping with other structures in the United Nations area and has only a low structure to cover the block front from 47th to 48th Streets. A tower rises to a height of 20 stories to house various society offices. The lower portion of the building contains facilities serving tenants and the public; an auditorium, an exhibition hall, an employees lounge, dining room, and numerous other facilities. The tower section is 69 by 139 feet in plan and has office space available from floors 3 to 18 inclusive. The American Society of Civil Engineers occupies the 17th and 18th floors. The 19th and 20th floors (actually four stories in height) house mechanical equipment needed for the operation of the building.

UNITED ENGINEERING CENTER

The above was abstracted from a manuscript copy of an article "The United Engineering Center," by Hal W. Hunt, Editor of *Civil Engineering*, scheduled for publication in the October 1961 issue of that magazine, which was furnished, together with the photograph of the new building, by William H. Wisely, Executive Secretary, ASCE.

—EDITOR

A World Map on a Moebius Strip

A Moebius strip is an non-orientable surface which can be constructed by giving a long strip of paper a single twist and then pasting together the two ends. This surface has many curious topological properties; it has only one side, and a cut down the middle will not yield two pieces, etc. A map of the world can be drawn on the Moebius strip in a manner comparable to the construction of a cylindrical projection. Use the center of the Moebius strip to represent the equator and space the meridians and parallels symmetrically as orthogonal lines. If desired, the parallels can be spaced as on the Lambert equal-area cylindrical projection. The only discontinuity is at the poles.

Perhaps the most interesting feature of this map is its property with respect to antipodal points. A pin pushed through the map at any spot emerges at the antipodal point. This is true anywhere on the map, even at the poles. Pushing a pin through a Moebius strip is equivalent to pushing a pin through a sphere along an axis of the sphere.

—W. R. TOBLER

University of Michigan

Baltimore Mapmakers

An Account of an Exhibition at the Peabody Institute Library, July–August 1961

By FRANK N. JONES

PEABODY INSTITUTE LIBRARY, BALTIMORE, MARYLAND

MORE than three centuries ago Augustine Herrman, Ambassador from New Netherlands to Governor Fendall of Maryland, urged upon Peter Stuyvesant the wisdom of mapping the Chesapeake Bay region. In 1659 he wrote, "the South River (i.e., Delaware) and the Virginias . . . ought to be laid down . . . in a perfect map. The sooner this is done the better, before Baltimoor whispers in the ear of the States of England."[1] Governor Stuyvesant made it clear that he had other things on his mind, but Herrman felt no hesitation in turning to "Baltimoor" for encouragement; the resulting map was engraved by Faithorne and printed in London in 1670, dedicated to Charles II and embellished with a handsome portrait of the cartographer, Augustine Herrman. "Baltemore Towne" is shown in this somewhat less than "perfect map" just at the mouth of Bush River about twenty-five miles east of the present city on the Patapsco River's northwest branch. The site marked by Herrman is now in the middle of Aberdeen Proving Ground.

It would be difficult to prove that the flamboyant Lord of Bohemia Manor was in any sense a Baltimore Mapmaker. Nevertheless, it seems only fair to recognize his eminent priority as a kind of cartographical founding father, even if he cannot be counted among those present for the exhibition this article describes. While numerous maps of Baltimore and of Maryland are inevitably included in the display cases, the primary objective has been to call attention to the wide variety of maps of many localities and of different types that have been produced in Baltimore over some two hundred years by a succession of draughtsmen, surveyors, engravers, lithographers, printers and publishers. Some of these contributors bore names of fame and distinction in mapmaking, others are obscure almost to the point of anonymity.

What may be the earliest representation of a street plan for Baltimore was reproduced as an inset on Thomas Henry Poppleton's 1823 map. It is described there as dating from 1729; it shows three named streets, eight lesser streets without names and sixty numbered lots. A graphic scale in perches is provided. No indication is given of the precise origin of this plan and no hint as to who may have been its maker. The Peabody map collection includes a manuscript plan dated 1756, also entirely anonymous.

Shortly after the Revolution, Baltimore's town fathers ordered an official survey which seems to have been completed about 1789 in manuscript but not printed. James Poapard issued in Philadelphia, from an engraving executed by himself, a "Plan of the Town of Baltimore and Environs, Dedicated to the Citizens of Baltimore. Taken upon the spot by their most humble Servant A. P. Folie, French Geographer." Two states of this map are known, one dated 1792, the other without date. It is not unlikely that while he was "upon the spot" the talented Mr. Folie may have had an opportunity to examine, if not to secure for himself, a copy of the survey then extant. The map includes more "environs" than town, but gives an accurate plan with detailed information and some decorative ornamentation. Scale is one inch to 40 perches.

One of the most obscure and intriguing personalities in the entire chronicle, A. P. Folie is variously described elsewhere as "Delineator"[2] and as "Geographer, from St. Domingo".[3] Opinions differ as to whether he deserves the designation of a Baltimore mapmaker; the scanty information we have shows merely that he served

one or two Philadelphia engravers for a few years during the last decade of the eighteenth century. He did, however, render the most complete and informative cartographical report on the town to that time; though transient his sojourn in Baltimore, he was "upon the spot", more than can be said for many a mapmaker before and since.

In 1801 the Baltimore firm of Warner and Hanna published a town plan, lavishly tinted with water colors; drawn to the same scale as Folie's, but embracing a much smaller area, it provides a fuller and clearer picture of the street grid and principal buildings. Francis Shallus made the engraving in Philadelphia. Early directories of Baltimore used this map as a base for several years. In 1870 it was republished without color by a local firm. In 1947 the Peabody Institute Library issued a facsimile of its copy of the original, reproduced in color by the Meriden Gravure Company.

Ten years after the Warner and Hanna plan there appeared in the columns of the *Federal Gazette and Baltimore Daily Advertiser* for July 27, 1811, a lengthy advertisement announcing a new project of rather magnificent proportions in the impressive promotional jargon of the day: "Under the Patronage of the Mayor and a large body of citizens . . . Proposals for Publishing by Subscription an accurate topographical plan of the City & Environs of Baltimore from an entire New Survey and actual Admeasurement now making expressly for the purpose by T. H. Poppleton, Practical Land Surveyor and Draughtsman". There follow four itemized "Conditions" advising potential subscribers that the scale will be "300 feet to one inch", that "Mathematical precision will be the predominant feature in this plan—general information the leading principal". Three editions were projected: "Plain impressions" at ten dollars per set of two sheets; "Coloured" at twenty dollars, and a few "got up in a very superior style of colouring" at thirty dollars for "those gentlemen . . . inclined to shew especial patronage to the undertaking".

Seven years and several mayors later, in February 1818, Poppleton was commissioned by the General Assembly of Maryland to proceed with the final printing of his map; evidence that perhaps not enough gentlemen had been inclined to show the particular kind of patronage most needed. The two sheets finally appeared in 1823 and they were well worth waiting for. Assembled they measure 53½ by 47 inches and present a richly embellished map of a four by four and one-half mile rectangular area at a scale of 600 feet to one inch. Also shown, as noted above, is an inset of the 1729 plan, together with perspective views of the city taken in 1752 and 1822. Margins are illustrated with thirty-seven engravings of public buildings, churches, monuments, and fountains made by J. Cone, while two plump Cupids measuring a stretch of lawn provide a graphic scale. The map sheets proper were engraved in New York by C. P. Harrison. While Mr. Poppleton's map is not excessively rare today, few copies have survived the ravages of time in their pristine condition. Many owners applied varnish to preserve the surface and subsequently folded the map for more convenient storage; the result is frequent breaks that obliterate significant areas. The Library was fortunate in being able to secure for display in this exhibition a privately-owned copy[4] that has been carefully preserved under glass and shows virtually no deterioration.

Less than a year after Thomas Poppleton used the columns of the *Federal Gazette and Baltimore Daily Advertiser* to solicit support for his venture, there appeared in the same paper under date of October 31, 1812, a heading, "SEAT OF WAR!" This was designed to draw attention to a map John Melish in Philadelphia had prepared to accompany a *Military and Topographical Atlas of the United States,* published in 1813. It has a part in the story of Baltimore Mapmakers because it was one of the first advertisements of Fielding Lucas, Jr., 1781–1854, who had opened for business a few years earlier at 138 Market Street, where he continued to draw, publish, and sell maps, atlases, and other books until his death. The sales appeal in the exclamatory heading cited above is shrewdly supple-

mented in smaller type describing the map "on which is marked the roads and distances from Washington to Montreal". Then follows a brief tabulation of Lucas' current stock of family Bibles, spelling books, works of Miss Edgeworth, playing cards, wafers, inks, maps of the world, etc.

The display contains more than twenty original maps and charts issued by Lucas or drawn by him for other publishers, notably Mathew Carey in Philadelphia, and six atlases with his imprint. His first U. S. atlas was made up of maps by Henry S. Tanner in 1814. His *General Atlas of the World,* 1823, is shown beside the review written by Jared Sparks and printed in the *North American Review* the following year. In 1824 he produced an attractive *Atlas of the West Indies;* a year later he had an important part in the production of the first comprehensive atlas devoted to the geography of one individual State. Lucas had lost the bid for providing the South Carolina legislature with an atlas to his good friend, Robert Mills, but Mills engaged Lucas to provide the maps, which were engraved for him by B. T. Welch and printed by John D. Toy.

A number of separate plates from the atlases are on display as well as maps made by Lucas, or published with his name to accompany canal reports, road surveys, and the like. An early specimen of considerable interest is the chart he made of Lewis Brantz's *Survey of the Patapsco River* and part of the Chesapeake Bay printed in 1819 from a plate engraved by Cone & Freeman, also of Baltimore. There is an inset, *Survey of the Harbor of Annapolis* by Jonathan W. Sherburne, U. S. Navy, and another of the harbor at Baltimore. Scale for the main chart is based upon 60 nautical miles to one degree; larger scales for the insets are all given in graphic form. The copy shown has been loaned by the Maryland Room of the Enoch Pratt Free Library through the courtesy of Miss Elizabeth Litsinger, Chief.

Two portraits of Lucas exist; one, in the Baltimore Museum of Art, by Thomas Sully, painted when the mapmaker was twenty-six, the other by Sarah M. Peale, painted thirty years later and now owned by the Maryland Historical Society. Mr. James W. Foster, Director of the latter organization and recently a biographer of Lucas,[5] kindly loaned the Peale portrait for display in the exhibition.

Lucas was in the midst of his distinguished career with copperplate maps when a German named Edward Weber, who had a sound knowledge of lithography, arrived in Baltimore in 1835. In partnership with his cousin, August Hoen, he produced what were probably the first show cards printed in color in the United States. When Lieutenant Charles Preuss returned with Colonel John C. Fremont from exploring the country between the Missouri and Oregon, Weber got the task of reproducing Preuss's maps for the official reports;[6] he thus executed the first lithographs used in U. S. government documents, volumes dated 1845 through 1848. He also made maps for local cemetery and water-supply projects, copies of which have been selected for display. At his death in 1848 Hoen established A. Hoen & Company, one of the nation's distinguished map-printing firms.

Hoen and his sons carried on the work Weber had started, much of it for actively growing railroad lines where their skill in getting precise delineations of profiles and elevations was highly important. Wall maps of the B. & O. lines across western Maryland were periodically revised through the fifties and sixties by successive engineers and surveyors, the Hoen firm usually making the reproductions. Excellent specimens of their work are plans and profiles for Gunpowder River and Swann Lake water systems made in 1852 and 1862, respectively. A U.S.G.S. Monograph by R. D. Irving, *Copper-bearing Rocks of Lake Superior,* 1883, utilized for the first time August Hoen's technique for showing geological data by line and color patterns, a method later adopted as standard procedure for publications of the Survey. In 1897 the firm made reproductions of seventy-six maps, many facsimiles of rare early documents, for the atlas volume in the report of the Venezuela-British Guiana Boundary Commission.[7] One member of

that Commission was also a Baltimore geographer distinguished in several other fields: Daniel Coit Gilman, President of the Johns Hopkins University.[8]

The excellence of Hoen map work brought contracts and commissions from many sources. In 1916 the American Geographical Society used a Hoen map in an article in the *Geographical Review* for the first time. It is displayed not far from a copy of the 1:30,000,000 map of the world which Hoen executed and the Society issued in 1953 for the U. S. State Department. Nearby also is a specimen sheet of the 1:5,000,000 map of the Americas dated 1947. Eighten Hoen maps are shown, including a facsimile reproduction of Disturnell's 1847 map of Mexico, made in 1947 for the Bancroft Library of the University of California.[9] A copy of the *Historical Geography of the United States,* 1932, by Paullin and Wright, produced by the American Geographical Society under auspices of the Carnegie Institution of Washington, is another notable and familiar sample of Hoen techniques.

More spectacular perhaps is a display revealing the photographic methods currently used by A. Hoen and Company to produce eight-color maps for the National Geographic Society, Washington. Through the courtesy of Mr. James M. Darley, Chief Cartographer of the Society, a complete set of transparencies drawn and photographed in Washington for the Society's November 1960 map of the World, is shown, illuminated from below, together with the map printed from them by the Hoen firm here in Baltimore. In an adjoining case is a map of the Arctic done in 1925 from a lithographic stone, the first project Hoen did for the National Geographic Society. Not far away a 1901 topographic sheet (Princess Anne, Maryland-Virginia) lies beside the actual stone from which the hydrographic tints on it were originally printed by Hoen presses sixty years ago. Photographs and an article about the Hoen family have been made available by the Enoch Pratt Free Library, and several maps not easily located were loaned by Mr. H. Hanson Hoen and Mr. A. Berthold Hoen, presently officers of the firm.

Miscellaneous maps and books produced by twelve or fifteen other firms in Baltimore during the past century and a half are also on display. Some of these, such as the excellent map of the city done in 1853 by Isaac Simmons from the survey made by William Sides, and Jacob Monk's Central America, 1857, are Hoen press work; other were made by J. Penniman as early as 1834, by Pratt, Clark & Co., Wagner & McGuigan, Schimd & Trow, the Friedenwald Photo Lithography Company, Norman T. A. Munder, and others. Maps issued by local hotels and by the Department of the Interior's General Land Office are included.

Because it was possible to show the actual stone from which a map on display was printed sixty years ago, and to illustrate the methods now in use by the Hoen Company, it seemed only fair to include something that might help visitors to understand the earlier, traditional, copper-plate process that preceded lithography in map making. Through the courtesy of a local artist, Mrs. Sarah C. Rhode, a blackened plate and the materials for working upon it are shown, together with a plate upon which a design has been executed, and a mounted impression from the same plate. Simplified as it has to be for this occasion, illustration of the three basic processes helps many to grasp the development of map reproduction right here in Baltimore. Plates for the Folie plan, Warner & Hanna's plan, Poppleton's great work and for many of Fielding Lucas's attractive maps, were made in Philadelphia and New York. After the introduction and spread of lithography Baltimore became an important map-printing center, and still continues with a complex photographic method to produce popular maps currently used all over the world by members of the National Geographic Society.

REFERENCES

1. Quoted from Heck, Earl L. W., *Augustine Herrman* . . . 1941, p. 62.

2. Croce, Geo. C. and Wallace, David H., *The New York Historical Society's Dictionary of Artists in America, 1564–1860.* New Haven, 1957, p. 233.

3. Prime, Alfred C., *The Arts and Crafts in Philadelphia, Maryland and South Carolina, 1786–1800.* Series Two. The Walpole Society, 1932, p. 83.

4. Mr. Robert Merrick of Baltimore.

5. Foster, James W. "Fielding Lucas, Jr., Early 19th Century Publisher of fine Books and Maps." *American Antiquarian Society, Proceedings,* v. 65, 1956, pp. 161–212. (The writer is indebted to this article and to its author for valuable suggestions in the preparation of this exhibition.)

6. *Report of the Exploring Expedition to the Rocky Mountains in the Year 1842, and to Oregon and North California in the Years 1843–'44,* by Captain John C. Fremont. Washington, 1845. (U. S. 28th Congress, 2d Session, House Exec. Doc. No. 166.)

7. *U. S. Commission . . . upon the True Divisional Line Between Venezuela and British Guiana. Report and . . . Papers.* Washington and Atlanta, 1896–97, 9 vols.

8. Wright, John K., "Daniel Coit Gilman, Geographer and Historian." *Geographical Review,* July, 1961, pp. 381–399; see particularly pp. 395–7.

9. One of the superior examples of an early map in facsimile is Albert B. Hoen's reproduction of the American Geographical Society's *Map of the World* on parchment by Giovanni Leardo, made about 1452. Mr. Hoen contributed a chapter, on the technical problems and how they were solved, to the volume about it issued by the Society in 1928.

Giant Book

In SURVEYING AND MAPPING, Vol. XXI, No. 1, March 1961, page 98, under this same heading we took note of the brochure on the "Big Book" descriptive of the activities of the Department of Mines and Technical Surveys, Ottawa, Canada.

We now learn that this book after being read by some 100,000 persons in 14 months during its trips totaling 10,000 miles here and there in Canada, has now been exhibited in United States. It was displayed at the Michigan State University, Lansing, Michigan, during the annual meeting of the Association of American Geographers, August 28 to September 1, 1961. This big book is available on request to all interested groups and organizations, but at least four months' advance booking is required to ensure its display.

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Surveying and Mapping Literature

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MAGAZINE ARTICLES

General Interest

RADIOCARBON DATING. W. F. Libby. *Science,* Vol. 133, No. 3453, March 3, 1961. (Describes methods and equipment use in the process which is of increasing use to archeologists, geologists, meteorologists, and oceanographers.)

SUBMARINE TOPOGRAPHY OF THE WESTERN STRAITS OF FLORIDA. G. F. Jordan and Harris B. Stewart, Jr. *Geological Society of America Bulletin,* Vol. 72, No. 7, July 1961. (Detailed illustrated description based largely on recent hydrographic surveys by the Coast and Geodetic Survey.)

THE VARIATION OF THE COMPASS FOR THE YEAR 1960. Albert M. Weber and David G. Knapp. *The International Hydrographic Review,* Vol. 38, No. 2, July 1961. (Describes the cooperation of the Coast and Geodetic Survey with the Navy Hydrographic Office in the compilation of the 1960 isogonic chart of the World.)

OCEANOGRAPHY—OLD SCIENCE, NEW FUTURE. Lt. Comdr. J. R. Morgan. *U. S. Naval Institute Proceedings,* Vol. 87, No. 8, August 1961. (Generalized but interesting review of the advances being made in the field of oceanography, including studies of the topography of the ocean floor.)

PHILIPPINE SURVEYING AND MAPPING INSTITUTE, 1961 AD INTERIM OFFICERS. *Philippine Surveying and Mapping Journal,* Vol. 1, No. 1, July–September 1961. (Brief biographical sketches of some of the leaders in the profession in the Philippine Republic.)

THE BOARD OF TECHNICAL SURVEYS AND MAPS. A. V. Torrijos. *Philippine Surveying and Mapping Journal,* Vol. 1, No. 1, July–September 1961. (Description of the functions of the organization for coordination of surveying and mapping activity in the Philippine Republic.)

FISHERY ECONOMIC MAPS AND TECHNICAL SURVEYS—THEIR IMPORTANCE IN AGRICULTURAL PROGRAMMING. Jose A. Domantay. *Philippine Surveying and Mapping Journal,* Vol. 1, No. 1, July–September 1961. (Describes different kinds of maps prepared in support of the Philippine fisheries conservation program.)

USES OF RADIOISOTOPES IN CIVIL ENGINEERING. J. S. Marcus. *Civil Engineering,* Vol. 31, No. 8, August 1961. (Uses of radioisotopes include the determination of leaks in underground piping, the measurement of soil density and moisture content, and the measurement of the rate of liquid flow.)

WEATHER MAPS. G. W. Howe. *The Nautical Magazine,* Vol. 186, No. 2, August 1961. (Review of the origin, development, and present needs for weather-map data in support of marine navigation.)

Cartography

A RE-APPRAISAL OF THE INTERNATIONAL MAP OF THE WORLD (IMW) ON THE MILLIONTH SCALE. Colonel R. A. Gardiner. *Empire Survey Review,* Vol. 16, No. 120, April 1961. (Broad discussion of problems and proposal of some solutions, including color plates showing suggested changes in symbolization and lettering on the IMW series.)

METHOD FOR TRANSFERRING A CHART PICTURE ENGRAVED ON A COPPER PLATE TO A PLASTIC FILM AS AN ORIGINAL FOR PLATEMAKING FOR OFFSET PRINTING. Swedish Hydrographic Office. *The International Hydrographic Review,* Vol. 38, No. 2, July 1961. (Description of method employed by Swedish Hydrographic Office.)

SYNTOSIL, A NEW PAPER-TYPE MATERIAL. Dr. Hans U. Ryser. *The International Hydrographic Review,* Vol. 38, No. 2, July 1961. (Information on the nature of the new product and its adaptation to map publication and other purposes.)

SCRIBING, A DIRECT REPRODUCTION PROCESS, FOR MAP PRODUCTION IN THE PHILIPPINES. Marcelino S. Tabin. *Philippine Surveying and Mapping Journal,* Vol. 1. No. 1, July–September 1961. (Detailed description of the process and the materials required.)

Control Surveys

THE INDIAN FOOT-METRE RATIO AND ITS ADOPTION IN THE INDIAN GEODETIC SYSTEM. J. C. Bhattacharji. *Empire Survey Review,* Vol. 16, No. 119, January 1961. (Attempt to obtain the most probable Indian foot-metre ratio as in the period 1831–69 to correlate it with that used

in later measurements and the International foot-metre ratio adopted in 1959.)

TRIGONOMETRICAL LEVELLING. R. J. Cornish, *Empire Survey Review*, Vol. 16, No. 119, January 1961. (Method depends in principle on plotting the line of sight, using the distance along great circle as abscissa.)

TRIANGULATION BY THE DIRECTION METHOD —A FURTHER NOTE. H. S. Williams. *Empire Survey Review*, Vol. 16, No. 119, January 1961. (Discussion of method introduced by Dr. van der Sterr, with a plea for conforming to it in minor triangulation.)

A SIMPLE METHOD OF COMPUTING THE ERROR IN THE CO-ORDINATES OF A POINT FIXED BY INTERSECTION BY THREE FIXED POINTS. Lieut. Colonel C. E. Nevald. *Empire Survey Review*, Vol. 16, No. 119, January 1961. (Graphic and mathematical explanation of the method.)

ON THE THEORETICAL FOUNDATION OF THE PRINCIPLE OF LEAST SQUARES. Dr. Bogomil Cvetkov. *Empire Survey Review*, Vol. 16, No. 119, January 1961. (Mathematical demonstration.)

IDENTIFICATION OF STARS BY LEARNERS. J. G. Freislich. *Empire Survey Review*, Vol. 16, No. 120, April 1961. (Suggests methods for making correct determinations.)

TREATMENT OF OBSERVATIONS: REJECTION AND WEIGHTS. A. B. Sunter. *The Canadian Surveyor*, Vol. 15, No. 8, May 1961. (Mathematical analysis.)

A STUDY OF REFRACTION IN THE LOWER ATMOSPHERE. P. V. Angus-Leppan. *Empire Survey Review*, Vol. 16, No. 120, April 1961. (Mathematical-meteorological examination of atmospheric conditions affecting surveying observations.)

EARTH SHAPE AND POTENTIAL. Dr. J. De Graff-Hunter. *Tijdschrift voor Kadaster en Landmeetkunde*, Vol. 77, No. 4, 1 Aug. 1961. (Technical and mathematical discussion of the shape of the earth, embracing the distinction between the concepts of the geoid and the figure of the earth.)

ELECTRONIC DISTANCE MEASUREMENT WITH THE GEODIMETER AND TELLUROMETER. Carl C. Winikka. *Civil Engineering*, Vol. 31, No. 8, August 1961. (Illustrated explanation of the uses and results obtained from the two instruments.)

Education

THE EDUCATION AND TRAINING OF MINE SURVEYORS. Reprinted from "The Mining Journal," London. *The Journal of the Institute of Mine Surveyors of South Africa*, Vol. 11, No. 6, June 1961. (Summary of a paper delivered to the Chartered Surveyors Annual Conference urging revision of the educational program from primary emphasis on coal mining to other fields of the mining industry.)

Instruments

THE GEODIMETER. A. T. Holmes. *The Canadian Surveyor*, Vol. 15, No. 8, May 1961. (Basic explanation of how the Geodimeter works and an evaluation of results obtained with the instrument.)

Property Surveys

ADJUSTMENT OF TRAVERSE NETWORKS. H. C. Brown. *Empire Survey Review*, Vol. 16, No. 120, April 1961. (Discussion of problems involved in establishing reference marks in a municipality of Northern Rhodesia.)

THE MARK FOUR GEODIMETER FOR SMALL SURVEYS. Andrew Gibson. *The Ontario Land Surveyor*, Vol. 4, No. 3, July 1961. (Suggests use of Geodimeter and T-2 in small but complex surveys to attain greater accuracy at smaller cost.)

Topography

THE COMPILATION OF A RECONNAISSANCE MAP OF ALEXANDER LAND, ANTARCTICA, FROM TRIMETROGON AIR PHOTOGRAPHS. D. J. H. Searle. *Empire Survey Review*, Vol. 16, No. 119, January 1961. (Detailed account of the operation using methods developed extensively by the Canadian and United States Air Forces.)

BOOKS AND PAMPHLETS

INDIANA, STATE BOARD OF REGISTRATION FOR PROFESSIONAL ENGINEERS AND LAND SURVEYORS, 39TH REPORT, 1959/60. (Includes copy of registration law and roster of engineers and land surveyors.) Indianapolis, July 31, 1961, 144 pp., illus.

MAP MAKING: THE ART THAT BECAME A SCIENCE. Lloyd A. Brown. Boston, *Little Brown and Company*, 1960. 217 pp., maps, illus.

ANNUAL REPORT, CANADIAN INSTITUTE OF SURVEYING, 1961. *The Canadian Surveyor*, Vol. 15, No. 9, July 1961. (Includes proceedings of the fifty-fourth annual meeting.)

STATE BOARD OF REGISTRATION FOR ARCHITECTS, ENGINEERS AND LAND SURVEYORS. Roster of registered architects, engineers and land surveyors, 1961. St. Paul. 85 pp.

MAPS MEAN ADVENTURE. Christie McFall. New York, *Dodd, Mead,* 1961. 128 pp.

GEODETIC COMPUTATIONS: PROBLEMS AND ANSWERS. U. S. Army Map Service, Foreign Control Division. Washington, D. C., 1961. 122 pp.

ALABAMA, ROSTER OF REGISTERED PROFESSIONAL ENGINEERS AND LAND SURVEYORS. State Board of Registration for Professional Engineers and Land Surveyors. Montgomery, 1961. 128 pp.

ANNUAL REPORT OF THE ASSOCIATION OF ONTARIO LAND SURVEYORS. 268 pp., illus. (Contains the proceedings of the 69th Annual Meeting, held at Windsor, Ontario, February 13–15, 1961.)

—LYMAN D. LYNN
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Distinctive Recent Maps

Principal Natural Gas Pipelines in the United States and Communities Served with Natural, Manufactured, and Mixed Gas is a 1960 publication of the Federal Power Commission. It is for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D.C. The map, at the scale of one inch to 60 miles, includes an "Index of operating companies." There are enlarged insets of "Pittsburgh and Appalachian Region," "Monroe [La.] Area," and "Los Angeles and Vicinity." This large, colored map measures 44 by 46 inches.

The rugged topography of Maine is effectively portrayed on the recently-published, shaded-relief map of the *State of Maine*. At the scale of 1:500,000, the map is another in the attractive and accurate series of shaded-relief maps published by the U. S. Geological Survey. It measures 42 by 30 inches.

Historic Massachusetts, A Travel Map to Help you Feel at Home in the Bay State, is an attractive and colorful pictorial presentation. It was designed and drawn by the well-known cartographic artist, Ernest Dudley Chase, and was published by the Massachusetts Department of Commerce, Boston. The map is 22 by 34 inches in size.

The Pennsylvania Geological Survey published in 1959 a *Map of the Glacial Deposits of Northwestern Pennsylvania,* at the scale of 1:125,000. It was compiled by V. C. Shepps, J. B. Droste, and R. F. Sitler under the supervision of G. W. White. The map, which measures 57 × 42 inches, includes all or part of the counties of Erie, Crawford, Warren, Mercer, Venango, Lawrence, Butler, and Beaver. Some fourteen moraines and other depositional features are identified. A 59-page descriptive booklet accompanies the map.

Mineral Industries of Illinois, a publication of the Illinois State Geological Survey, was compiled and prepared by the Educational Extension Division from data available at the Geological Survey. Mineral Fuels, Rock and Rock Products, Sand and Gravel, Clay and Clay Products, and Fluorspar and Metals are mapped. The scale is 1:500,000 and the measurements are 50 by 30 inches.

Wayne F. Meents and Alfred H. Bell have compiled a map of the *Oil and Gas Industry of Illinois,* which was published in 1961, also by the Illinois State Geological Survey, Urbana. Data shown include oil and gas fields, crude oil, refined products, natural gas pipelines, refineries, and propane and gas storage facilities. The map is at a scale of 1:500,000 and measures 51 by 30 inches.

A map locating the *Shipping Coal Mines in Illinois* compiled by Jack A. Simon, was published in 1961 by the State of Illinois in cooperation with the Midwest Coal Producers Institute. It is 51 by 30 inches and is at the scale of 1:500,000. The geologic boundaries of the Pennsylvanian system are shown and the several major coal producing regions are outlined. Shaft, slope, and strip mines are individually identified.

More than 80 types of rocks are mapped on a 1961 *Geologic Map of Washington* published by that State's Division of Mines and Geology (Olympia), with the cooperation of the U. S. Geological Survey. It was compiled by Marshall T. Huntting, W. A. G. Bennett, Vaugn E. Livingston, Jr., and Wayne S. Moen. A small index map of the State shows sources of geologic data. The map sheet, which includes legend, descriptions of formations, and a list of data sources, measures 51 by 74 inches. The scale is 1:500,000.

A new, 1961 edition, has been published of *Bartholomew's Contoured Road Map of the British Isles,* at the scale of 1:1,000,000. The familiar Bartholomew contour coloring has been modified, on this map, by the addition of hill shading, which accentuates the relief in the more hilly areas of the British Isles. There is an inset map at reduced scale showing county boundaries and a scale of distances between selected towns. The map, which measures 41 by 35 inches, is published by John Bartholomew & Son, Ltd., of Edinburgh.

Perimetres des Titres Miniers d'Hydrocarbures maps the limits of property titles to lands possessing hydrocarbon deposits in France. The map is at the scale of 1:2,000,000 and was published in 1961 by the Bureau de Recherches de Pétrole, Paris. It measures 20½ by 24½ inches.

Similar data are shown for North Sahara on a map, by the same publisher, entitled *Afrique du Nord-Sahara Perimetres de Titres Miniers d'Hydrocarbures.* The latter map is 33 by 48 inches and is also at the scale of 1:200,000.

A third map, at the scale of 1:5,000,000, shows *Titres Miniers d'Hydrocarbures* for west central Africa extending from the Sahara southward to the Congo River. It has an inset map of the Malgache Republic (Madagascar).

République Centrafricaine Carte Routière shows roads, airports, towns and villages, missions, and administrative boundaries of the new Central African Republic. The map, at the scale of 1:1,500,000, was compiled and published by le Service Geographique, Brazzaville, and printed in Paris by the Institut Geographique Nationale. The map measures 26 by 40 inches.

The Director of Federal Surveys, Salisbury, published in 1960 a *Vegetation Map of the Federation of Rhodesia and Nyasaland,* at the scale of 1:2,500,000. The map was compiled by J. M. Rattray and H. Wild, from data on various published and unpublished maps. Cities and towns, roads, railways, and administrative boundaries are shown, in addition to the distribution of some 26 vegetation types.

Issued by the same publisher is a 1961 *Provisional Geological Map of the Federation of Rhodesia and Nyasaland.* Scale and size are the same as on the vegetation map. Some fourteen different formations, ranging from Archaean to Recent are mapped, in addition to several intrusive types of igneous rocks of various ages.

Nigeria, Location of Industries, Main Agricultural Exports and Mineral Deposits maps the resources of that country. It was compiled and published in 1959 by Federal Surveys, Nigeria. The scale of the map is 1:3,000,000 and it measures 16 by 19 inches.

The same agency also issued, in 1960, a revised edition of the *Road Map of Nigeria* at the scale of 1:1,750,000. Railroads, post, telegraph, and telephone offices; towns and villages; and administrative boundaries are shown in addition to roads. The map is 27 by 32 inches.

Distribution of native tribes is shown on a map entitled *Peoples of the Middle Niger Region of Northern Nigeria.* The scale is 1:600,000 and the size is 32 by 39 inches. In addition to locating some nine tribes, the map shows administrative boundaries, towns and villages, railways, and all-season roads. The publisher is not indicated on the map.

A revised (1960) edition of the *Road Map of Tanganyika* has been issued by the Ministry of Lands and Surveys, Dar es Salaam. Five classes of roads, with mileages, railroads, river ferries, and territorial and provincial boundaries are shown. The dimensions of the map sheet are 27 by 32 inches and the scale is 1:2,000,000. There are enlarged insets of the Tanga and Kilimanjaro regions.

—Walter W. Ristow

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Books in Review

INTRODUCTION TO GEOMETRY, H. S. M. Coxeter, Professor of Mathematics, University of Toronto. *John Wiley & Sons,* New York-London, 1961. 443 pp.

This textbook on geometry, the author states in his preface, constitutes an attempt to revitalize this sadly neglected subject. Many factors have contributed to the prevalent notion among students and, one might add, among too many mathematicians that geometry is merely a part of alegbra or of analysis. The practising engineer who has chosen his profession partly from a love of geometry as an art will find that this is not one of those abstract books on geometry that strive to present whole chapters without a single picture diagram.

The book is divided into four parts corresponding roughly to four years of college work, and each of the twenty two chapters is reasonably self-contained. Part I uses only the synthetic methods of the Greeks familiar from high school geometry. Part II introduces the methods of coordinate or analytic geometry. Part III has chapters on what our colleges present generally under the title of "Higher Geometry", such as Affine, Projective, and Non-Euclidian geometry, etc. Part IV finally introduces topics requiring knowledge of the methods of analysis such as differential geometry, a subject which has developed from the needs of the geodetic surveyor and to which Civil Engineering curriculums ought certainly, in the future, devote more attention than they do at present. Chapters on tensors, topology and four-dimensional geometry conclude the work.

The presentation in the latter parts of the book becomes, of necessity, somewhat sketchy. Both as an "introduction" to this most fascinating of subjects for the more casual reader, and as a beautiful synthesis of the topics in the many branches of geometry for the advanced student, this volume can be enthusiastically recommended.

ERWIN SCHMID

Grundzüge der Ausgleichungsrechnung. W. Grossmann. (In German.) Second edition. *Springer-Verlag,* Berlin, Gottingen, Heidelberg.

This second edition of "Principles of Adjustment Computation" is considerably expanded over the first edition which was published in 1953. In the first chapter the author clearly defines and differentiates the various types of errors; mean-square, probable, relative, systematic, and constant errors. The next three chapters are devoted to the least-squares method of adjustment procedures of observation and condition equations with numerous examples from geodesy including an adjustment of a Tellurometer net.

The final chapter is an introduction to the use of matrices in adjustment computations.

The book is well written and should serve well as a textbook for the study of geodetic adjustments. It is also an excellent reference book for a civil engineer's library.

JACOB A. DUERKSEN

Cogo—A Computer Programming System for Civil Engineering Problems. Prof. C. L. Miller. Massachusetts Institute of Technology, Cambridge 39, Massachusetts, August 1961. Nomogram and 33 pages.

The development of a new "language" which will greatly simplify communication between civil engineers and computers has been announced by Professor C. L. Miller, director of the Civil Engineering Systems Laboratory at the Massachusetts Institute of Technology.

The new computer programming system, called COGO (for coordinate geometry), makes it possible for the engineer to give instructions to digital computing machines using the technical language of the civil engineering profession—the same words one engineer would use in describing a problem to another engineer. The computer understands such words as "locate", "inverse", "intersect", "area", "ramp", "alignment", and similar engineering terms.

Without such a system it is necessary for the engineer to instruct the machine in a primitive or pseudo language more closely related to the machine's circuits than to the engineer's problems. A problem which can be solved with a dozen COGO instructions might typically be equivalent to several thousand machine-level instructions.

The Cogo system was announced by Professor Miller at the meeting of the American Association of State Highway Officials held at the Somerset Hotel in Boston. Operational versions of the system are already in daily use at M.I.T. and at the Puerto Rico Department of Public Works. A Cogo system specially designed for the new engineering computer was due to be installed by the Massachusetts Department of Public Works this fall.

"In addition to practical use in the civil engineering profession," said Professor Miller, "the Cogo language will be used by civil engineering students at M.I.T. The level of the language makes it feasible to give the students full scale engineering problems as homework assignments."

Professor Miller said that the new system is expected to have considerable influence on how civil engineers use computers. "Previously, a very large investment in man hours and money was involved in developing the computer program for one specific problem. It was necessary to use the fixed program thousands of times to warrant the investment. But rarely are any two civil engineering problems—such as the designs of complex urban expressways—exactly alike.

"Now, with the high efficiency of the Cogo system, it is technically and economically feasible, in terms of time and costs, to write a separate and unique program for every problem. No two need ever be alike. A particular program is used only once and then discarded."

Although present operational forms of Cogo are already fulfilling a major production role, Professor Miller announced that developments to date are only the first step in a much larger system. "Current research being conducted by the Civil Engineering Systems Laboratory," he said, "is aimed at attaching a drafting machine to the computer. The 'vocabulary' of the Cogo language will then be expanded to include the words which the engineer uses in communicating with a draftsman. The ultimate goal is a machine-aided design system which completely frees the engineer from the routine chores so that he can devote his full attention and talents to the creative and imaginative thinking role for which he is professionally trained."

It seems appropriate to include a few details of the Cogo program.

Each command to the computer and the *data* to be used in executing the command are entered into the computer at the *same* time. The following are four examples of Cogo statements (English command plus required numerical data):

STORE	46
LOCATE/AZIMUTH	19 46 172.17 35 14 26
LOCATE/ANGLE	97 19 46 100.00 90 00
INVERSE/BEARING	46 97

Very extensive problems can be solved in a *continuous* run on the computer because Cogo programs can be *indefinitely* long. An entire interchange or subdivision can be thought of as a single problem requiring only one trip to the computer. At the same time, Cogo makes effective and efficient use of computers on the smallest of problems.

Cogo is *not* a compiler like FORTRAN or ALGOL, nor an interpreter like INTERCOM or BELL. Nor is it like GOTRAN and similar one-shot problem systems. Problems are executed in machine language, but no translations or pseudo instructions are involved. A control routine encodes the name, locates an entry point in the instruction area, and turns control over to a machine language routine which carries out the necessary computations. Hence, Cogo programs are executed at the same speed as equivalent fixed machine language programs.

It was found that most geometric problems could be reduced to two fundamental operations:

(1) Compute the *location* (coordinates) of points given various sets of information such as distance and direction from a known point, intersection of two lines, offset from a known point to a curve, etc.

(2) Compute the *length* and *direction* of *lines* between known points.

It was also evident that such operations and most related problems (such as areas) could be efficiently solved mathematically in terms of coordinate geometry.

As an example of a program statement,

LOCATE/AZIMUTH 22 51 2236.07 116 34 00

is Cogo shorthand for "locate point 22 by going a distance of 2236.07 feet from point 51 at an azimuth of 116° 34′ 00″, ouput the coordinates of point 22 and also store them." A more involved command CURVE/INTERSECT/SPIRAL is still a typical example of many possible statements. A Cogo system might have of the order of 30 to 80 such commands.

An understanding of how Cogo works internally may be explained by discussing one specific system—the Puerto Rico Cogo system for a 20 K card IBM 1620 machine. (Puerto Rico Cogo will be the model for all future systems for some time to come.)

The key routine is the Cogo Control Routine

—which operates in somewhat the same manner as a "monitor." The Control Routine reads the Cogo statements, interprets the command name, determines what action to take, processes CALL statements, and sends control to the proper set of machine language instructions.

Each Cogo command may be thought of as a conventional machine language program of from a few to hundreds of machine language instructions. The Control Routine's function is to send control to the proper internal program, such as a program for intersecting two lines or adjusting a traverse. All such programs for all Cogo commands cannot be stored in internal core memory at the same time. To solve this problem for a small memory, a CALL system was developed. When the Control Routine detects a CALL card, it reads and stores the following 100 cards into a section of memory. The "plug" decks of 100 cards each contain a group of related programs. The plug decks are inserted directly in the deck of statements at places where they will be needed by the statements which follow. This permits continuous runs of indefinite length without any operator intervention. (Indeed, the sum total of essential operator instructions is as follows: "Place the COGO LOAD deck plus statement deck with interspersed plug decks, where needed, in the Read hopper. Press LOAD.")

—G. C. TEWINKEL

SCIENTIFIC RUSSIAN GUIDE, Handbook for Students and Professionals Interested in Scientific Russian. Mary A. Emery and Serge A. Emery. *McGraw-Hill Book Company, Inc.,* New York, Toronto, London, 1961. 191 pages.

The Scientific Russian Guide, by Mary A. Emery and Serge A. Emery, would be a valuable contribution to a Russian-English scientific translating agency.

Sections one and four of the book, having human interest as well as scientific vocabulary, I consider the better part of the book as a textbook for college and university students.

Parts two and three are highly technical and dry. For example, in lesson 36, one sentence is 10 lines long. A beginning student may become discouraged with such a long and involved sentence.

However, the glossary on pages 121–141 is excellent, but because it covers several fields of science it is strong on general scientific background but weak in the vocabulary of any one branch of science.

Since there are not too many good scientific translation aids, I would recommend adding this book to any library that is interested in scientific translations.

—MRS. REVA K. BERMAN

BIVARIATE TABLES FOR THE CONFORMAL TRANSFORMATION OF GOLDFIELD COORDINATES TO GAUSS CONFORM COORDINATES. G. B. Lauf, Head of Department of Surveying, University of the Witwatersrand, Johannesburg, Union of South Africa; published by the author. 44 pages.

Dr. Lauf has computed a set of tables to transform local coordinates, established in essence on a plane and covering and area of about 165 square miles, directly into a modern Transverse Mercator coordinate system and vice versa. These tables are of limited local application, of course, but the engineer faced with a similar transformation may find use for his 25-page introduction describing the theoretical aspects of the problem, including the development of the complex polynomial used, interpolation, formulas, and the like.

—ERWIN SCHMID

PROCEEDINGS OF CONFERENCES ON LAND SURVEYING (1960 and 1961). *Engineering Bulletin,* Purdue University, July 1961, Vol. XLV, No. 4, (Engineering Extension Series No. 107), compiled and edited by Ken S. Curtis. Paper cover, 6×9, 112 pages, illus. $2.00.

This issue of the *Engineering Bulletin* is made up entirely of papers presented at the Conferences on Land Surveying held at Purdue University, January 14–17, 1960, and January 12–14, 1961, under the joint sponsorship of the School of Civil Engineering and the Division of Adult Education of Purdue University, and the Indiana Society of Professional Land Surveyors.

In addition to a panel presentation, including five formal papers, on the subject "The Subdivision Control Ordinance," eleven other papers are included, as follows:

"Who or What is The Good Land Surveyor?" by Lloyd H. Kemmer, Associate Professor of Civil Engineering, Purdue University, Lafayette, Indiana;

"Your Problems Are Our Problems," by S. C. Leibing, Secretary, Indiana State Board of Registration for Professional Engineers and Land Surveyors;

"Design Features of Modern Surveying Instruments," by Porter W. McDonnell, Jr., Eugene Dietzgen Co., Chicago, Illinois;

"Mortgage Loan Surveys," by R. Niven Stall, L. M. Brown Division, Lawyers Title Insurance Corporation, Indianapolis, Indiana;

"Site-Plan Surveys," by Walter Scholer, Architect, Scholer and Associates, Lafayette, Indiana;

"Microfilming of Field Notes and Plats," by Margaret Pierson, Archivist, Indiana State Library, Indianapolis, Indiana;

"Topographic Mapping Progress in Indiana," by Shirley Waggener, Project Engineer, U. S. Geological Survey;

"Subdivision Planning and Approvals," by Earl J. Mann, Zone Site Planner, Federal Housing Administration, Chicago, Illinois;

"Easement Planning for Public Utilities," by J. Earl Goodwin, Indianapolis Power and Light Company, Indianapolis, Indiana;

"Legal Aspects of Dedications and Easements," by John Grimes, School of Law, Indiana University, Indianapolis Division; and

"Report of Summary of Country-Wide Fees and Salary Studies as Prepared by the American Congress on Surveying and Mapping of March 1959," by James Dankert, Paul I. Cripe, Inc., Indianapolis, Indiana.

—HOWARD S. RAPPLEYE

ENGINEERING COLLEGE RESEARCH REVIEW 1961. Edited by Paul T. Bryant and John F. Penn. Engineering College Research Council of the American Society for Engineering Education. Paper cover, 6×9, xx+476 pages. $4.00.

This 1961 edition of a biennial publication is a tabulation of information concerning research being carried on at the 121 institutions which are members of the Engineering College Research Council. The information given for each institution includes: the name of the institution, mail address, research policies, research personnel, research expenditures, research income, and *research projects now active*.

From a rather casual study of the 52-page index, it seems that research projects on "surveying" are conspicuous by their absence; research on "photogrammetry" is active at three institutions; research on "instrumentation" is active at 16 institutions, but only one of these projects seems to bear any resemblance to work on surveying instruments; "theodolite" leads to work at one school, apparently an investigation of the accuracy attainable with one particular "American" instrument; "geodesy" draws a blank; "mapping" looks a bit more promising, with one school researching on "topographic" mapping; "conformal" mapping looks promising, but leads to a research on heat transfer; and so it goes!

What's the matter? Do we know all there is to be known about surveying, mapping, and closely allied subjects, or do the engineering schools follow the same pattern in their research activities regarding surveying as they apparently are doing regarding instruction in the same subject?

—HOWARD S. RAPPLEYE

BOOK NOTES

PLANE COORDINATE INTERSECTION TABLES (2½-MINUTE)—WEST VIRGINIA. Coast and Geodetic Survey, Publication 65–1, Part 46, 8×10, paper cover, 52 pages. Available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. at 35 cents per copy.

PLANE COORDINATE INTERSECTION TABLES (2½-MINUTE)—MISSISSIPPI. Coast and Geodetic Survey, Publication 65–1, Part 22, 8×10, paper cover, iii+92 pages. Available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 50 cents per copy.

PLANE COORDINATE INTERSECTION TABLES (2½-MINUTE)—TENNESSEE. Coast and Geodetic Survey, Publication 65–1, Part 40, 8×10, paper cover, iii+58 pages. Available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 40 cents per copy.

CONTROL LEVELING. Coast and Geodetic Survey Special Publication No. 226 (Revised 1961), 6×9, iv+20 pp., illus., is available from the Superintendent of Documents, Government Printing Office, Washington 25, D.C., at 15 cents per copy.

This booklet describes briefly the instruments, methods, results, etc., of the control leveling activities of the Coast and Geodetic Survey. Also included is information on the procurement of leveling data, a plea for cooperation in the preservation of bench marks, and instructions as to procedure when bench

marks are found to be in the way of construction activities or in other circumstances which require their relocation. This booklet should be in the working library of every surveyor.

COLOR-SEPARATION SCRIBING. Topographic Instructions of the United States Geological Survey, Book 4, Chapters 4B1, 4B2, and 4B3, paper cover, 8×10, 31 pp., illus. Available from the Superintendent of Documents, Government Printing Office, Washington 25, D.C., at 40 cents per copy.

This volume gives instructions for preparing topographic map manuscripts for multicolor printing by scribing on coated plastic sheets. Chapter 4B1 describes the preparation of map manuscripts for color-separation scribing, and Chapter 4B2 describes and illustrates the techniques of scribing operations. Chapter 4B3, Color-separation Drafting, covers smooth-line inking, an alternative color-separation procedure now largely superseded by scribing.

TELLUROMETER MANUAL. Austin C. Poling. U. S. Coast and Geodetic Survey Publication 62–1, revised (1961) edition, paper cover, 7¾×10¼. v+76 pp., illus., diagrams, and tables. Available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 45 cents per copy.

This revised edition of the *Tellurometer Manual* contains changes and additions resulting from about two years experience with the Tellurometer in the field and additional experience in office computations. The publication of this manual is not an endorsement of the Tellurometer as being the only instrument suitable for measuring distances electronically. It was prepared for the use of the field parties of the Coast and Geodetic Survey using the Tellurometer.

The four sections of the publication cover: The Tellurometer distance-measuring system; computations; field troubleshooting; and instructions for Tellurometer traverse. There is an appendix covering the general theory of operation. Twenty-six pages of assorted tables round out the publication.

G. O. P. Price List 53

Attention—Surveyors and Mappers—Free

50th Edition—Price List 53, July 1961—on *Maps, Engineering, Surveying*—publications for sale by Superintendent of Documents of the U. S. Government Printing Office, Washington 25, D. C.

If you wish to keep abreast of the latest bulletins, manuals, and special maps published by the U. S. Government Printing Office and available to the public at nominal prices, write to the Superintendent of Documents, Washington 25, D. C., requesting a free copy of Price List 53, July 1961 edition, *Maps, Engineering, Surveying.*

This 22-page listing of subject interest items is recommended to all surveyors and users of special maps as an important document for your library or working reference.

—W. S. DIX
Executive Secretary, ACSM

NOTE: A new and popular biweekly list of selected U. S. Government publications, now received by more than 850,000 people, describing new publications as they are placed on sale, may also be obtained free by writing to the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., or by filling in a special form on the last page of the PL 53 (50th Edition) mentioned above.

PLAN TO ATTEND THE 1962 ACSM-ASP COMBINED MEETINGS AND EXHIBITS SHOREHAM HOTEL, WASHINGTON, D.C., MARCH 11–17, 1962.

(*See* pages 547 & 548 for further information.)

Abstracts of Articles on Geodesy and Related Fields

The Army Map Service, of the Corps of Engineers, U. S. Army, publishes quarterly a series of processed sheets under the title: "Abstracts of Articles on Geodesy and Related Fields." The following excerpts are from the issue bearing the date of July 1961 and are selected for reprinting in SURVEYING AND MAPPING as being of possible interest to a considerable percentage of our readers. The selection has been somewhat arbitary, and only those abstracts believed to be of quite general interest have been included. —EDITOR

824 *Fifty Years Gauss-Krueger Coordinates in Autria* (50 Jahre Gauss-Krueger-Koordinaten in Oesterreich). K. Levasseur

A comprehensive and enlightening paper is presented concerning Gauss-Kreuger coordinates and the historical events which led to their introduction in Austria.

The following topics discussed in great detail and supplemented by formulae, diagrammatical sketches, map sections, etc., wherever required for the sake of completeness, make up the paper:

Fundamental data of the Austrian national survey at the turn of the century;

Fundamental data of the Austrian cadastral survey at the turn of the century;

Austro-Hungarian main triangulation net;

Preliminary efforts for re-triangulation of Austria;

Gauss-Krueger projection;

Non-Austrian efforts for timely systems of coordinates;

Official efforts for re-triangulation of Austria and introduction of conformal Gauss coordinates for civilian and military surveys;

Beginnings of Austrian re-triangulation and Gauss-Engel meridian zones in practice;

Efforts for an international regulation of fundamental surveying and mapping data;

Resumption of re-triangulation and its present status;

Fundamental data of cadastral survey in Burgenland; and

Fundamental data of the re-triangulation as it holds at present.

An extensive bibliography refers to a great variety of basic articles.

OESTERREICHISCHE ZEITSCHRIFT FUER VERMESSUNGSWESEN (German) AMS-GL-B661.-7000, Vol. 48, Nos. 4 and 5 (1960)-mc

825 *The Development of Geodetic Surveys in Bulgaria* (Rozwój prac geodezyjnych w Bulgarii). Prof. Vasil Peevski

The first topographical survey in Bulgaria (1877–1878) was carried out by the Russian Topographic Corps, at the scale of 1:42,000 and covered an area of 400 sq. km. A triangulation net was developed in 22 chains. There were six base lines, 3 to 6 km. in length, and 1,274 trig points. In 1897, the Bulgarian Army had formed its own Topographic Service. It produced, on the basis of the Russian survey, a 1:105,000 topographic map. In 1901, the Topographic Service was reorganized and named the Military Cartographic Institute. The Institute produced a 1:50,000 map of Bulgaria. From 1912 to 1918, the Institute had produced maps at the scales of 1:40,000 and 1:50,000. After World War I, the Institute was renamed the National Geographic Institute. In 1921, the Institute developed the first-order triangulation in Bulgaria. There were 75 first-order points and, in 1940, when Bulgaria extended its first-order net over Dobrudja, 18 new first-order points were added. The new first-order triangulation consists of 93 points and a number of equilateral triangles with sides 40 to 50 km. in length. The first-order triangulation was based on the following 4 base-lines: Sofija (12 km.), Lom (10.5 km.), Ruschuk (6.5 km.), and Jambol (13.5 km.).

Astronomic observations were carried out at 19 first-order trig points.

The first-order triangulation net was adjusted by the Boltz method. There were 159 conditional equations for 114 triangle equations, 42 side equations, and 3 base-line equations. The mean-square direction error was $\pm 0.426''$ and the mean-square angle error $\pm 0.650''$. The Hayford ellipsoid was used for computations. The Gauss-Kreuger conformal projection was utilized with the central meridians 24° and 27°

E. G. and the coefficient of reduction 0.9999. By the end of 1930, the coordinates of the first-order trig points were computed.

After the development of the first-order triangulation net, the second-order triangulation net was developed. There are 275 second-order trig points. The average distance between these points is 20–30 km. By adjustment of stations, the mean-square direction error of ±1.2″ to 1.5″ was obtained. The adjustment of the second-order triangulation net was carried out in groups of 2 to 15 points. Since 1929, the development of the third-order triangulation net was carried out. According to their accuracy, the points of the third-order tranigulation were divided into three groups, named "red points", "green points" and "yellow points". There are about 6,000 third-order points. The distance between the points is about 3–5 km.

In 1924, the National Geographic Institute initiated a precise leveling survey. As leveling datum the mean sea level of the Black Sea at Varna tidal gauge was adopted. By 1935, about 8,000 km. of lines were leveled, covering all of Bulgaria, and in 1940 the precise leveling was extended over the newly acquired Dobrudja. Leveling was carried out with the mean-square error of 1.5 mm. and the systematic error of 0.3 mm. per one kilometer of leveled line. The observations were carried out with Zeiss leveling instruments. For the adjustment of the results of the precise leveling, the leveling lines were divided into main (first-order) and supplementary (second-order) nets. The main leveling net consists of 4,200 km. of leveled lines, subdivided into 21 closed loops. The supplementary leveling net consists of 94 lines with a total length of 3,800 km.

It has to be pointed out that the triangulation nets, which were established, measured, and adjusted by the National Geographic Institute, should be densified. Therefore, third- and fourth-order nets are planned. The topographical surveys were utilized for the compilation of the 1:25,000 map. At present, surveys are being carried out by photogrammetrical methods. The aerial surveys are being carried out with Wild phototheodolites. The Institute has acquired a Wild A 2 autograph. The very mountainous areas of Bulgaria, such as Rila, Pirin, Rodopy mountains, were 60% surveyed by the plane table method. The flat areas of Bulgaria are being surveyed photogrammetrically. Hugershof-Heyde and Zeiss SEG-I rectifiers are used for 1:25,000 photoplans. More and more stereophotogrammetric surveys are being used instead of the plane table method. The main task of the National Geographic Institute is to produce a new 1:25,000 map of Bulgaria. And the main task of the Bulgarian geodesists and cartographers is the production of the 1:5,000 topographic map of Bulgaria, under the supervision of the Chief Geodetic and Cartographic Administration. For this new map the Krasovsky ellipsoid is being used instead of Hayford's. The cadastral surveys were initiated in 1885. Ever since, cadastral operations were carried out by various governmental agencies. The following agencies were carrying out cadastral surveys: the Ministry of Agriculture, the Ministry of Communal Works, Roads and Husbandry, the Chief Railroad Direction, the "Geoplanoprojekt" Enterprise, the "Kartoprojekt" Enterprise, and the Kartnogeopriborna Factory.

PRZEGLAD GEODEZYJNY (Polish) AMS-GL-B676.7100, Vol. 32, No. 10 (1960)-ma

827 *Fulfillment of the Czechoslovak Second Five-Year Plan and the Third Five-Year Plan. Main Goals in the Field of Geodesy and Cartography.* (Plnění úkolů druhého pětiletého plánu a hlavní úkoly třetího pětiletého plánu v geodézii a kartografii ČSSR). Jaroslav Průša

The plans for the Second Five-Year Plan were made by the Main Administration of Geodesy and Cartography (USGK) and were satisfactorily fulfilled as follows:

The geodetic foundation was consolidated for the entire territory of the country. The trigonometric net, with an average side length of 2–3 km., was completed. The unfiorm first-, second-, and third-order leveling nets were also completed. The Pecny Observatory was remodeled and re-equipped. The entire country is now covered by the astro-geodetic, trigonometric, leveling, and gravimetric nets, which served as geodetic basis for topographic mapping. Large-scale 1:1,000 and 1:2,000 mapping has been initiated for industrial purposes. The countrywide 1:10,000 (1:5,000)* survey is progressing satisfactorily. Until 1960, 16.5% of the entire number of sheets needed to cover the country as a whole were produced and published by USGK.

Cadastral surveys and large-scale mapping for special industrial projects were carried out. There was a large number of school-maps and atlases published.

The main goals of the Third Five-Year Plan were set as follows: Revision of the geodetic foundation and the completion of all transformations. The 1:10,000 Map of Czechoslovakia will

* Selected areas are being surveyed at the scale of 1:5,000.

be completed. At present, 41.9% of the territory has been surveyed. By 1965 the entire territory will be surveyed, and the last 1:10,000 sheet will be published by the end of 1967. For technical and industrial purposes, aerial surveys at the scales of 1:1,000, 1:2,000 and 1:5,000 will be carried out. The tempo of production will be accelerated by 30%. New and better equipment will be acquired.

GEODETICKY A KARTOGRAFICKY OBZOR (Czech) AMS-GL-B662.7200, No. 1 (1961)-ma

830 *Forward and Inverse Computations on the Ural I Electronic Computer* (Vypočet obou hlavnich geodetickych úloh na samočinném počitači Ural I). František Charamza

The Czechoslovak Research Institute for Geodesy, Topography, and Cartography (VÚGTK), Prague, has acquired a Russian Ural I electronic computer. A fairly detailed description of the Ural I is presented.

The usefulness of the Ural I in geodetic computations is discussed in detail and the proper formulae for forward and inverse computations by means of Ural I are presented.

GEODETICKY A KARTOGRAFICKY OBZOR (Czech) AMS-GL-B662.7200, No. 1 (1961)-ma

834 *On the Problem of Transforming Various Cartographic Networks of Different Projections* (Příspěvek k převodu kartografickymi sítěmi různých zaobrazení). Vladislav Hojovec

Very often the construction of small-scale maps requires transformation of basic cartographic material, which appears in various map projections into a single, compiled, map original.

A new method is suggested concerning transformations of various cartographic networks, by means of linear methods, from one map projection into another, thus covering an extended area. The new method derives its formulae from the two basic map projections, conformal and equal-area, with an emphasis on the most frequent requirements in practical fields.

Appropriate formulae are derived and reexamined. The transformation in the case of conformal projections appears much simpler than that of the equal-area projections. In the latter case, the use of various opticomechanical devices is suggested, which can help in solving even the most complicated problems of higher-order transformations.

GEODETICKY A KARTOGRAFICKY OBZOR (Czech) AMS-GL-B662.7200, No. 12 (1960)-ma

836 *The Topographic Troops of the Army* (Die Topographietruppe des Heeres). Oskar Albrecht

The topographic troops are a component of the military-geographic service of the Federal Army and continue the tradition of the mapping and survey troops of the former army. The new name is in conformance with the terminology of the NATO countries. However, in contrast to the other powers where the topographic troops belong to the engineers, the German topographic troops, for reasons of tradition, remain under the artillery and wear red piping.

The motorized topographic battery consists of three platoons: survey, photogrammetric, and cartographic.

The survey platoons, the same as in the last war, support the long-range artillery, especially rocket artillery by furnishing survey data of all types.

When fully equipped, the photogrammetric platoons will be able to handle rectification of photography, map revision from photography as well as photogrammetric determination of control points.

The cartographic platoons are being formed at the present time. They will be equipped for printing and map reproduction. They also will be able to do limited map revisions.

The divisional map offices belong to the topographic troops. Their main function is storage of maps and their distribution to the battalions. But they are also prepared to carry out some cartographic work.

The topographic troops also furnish instructors for officer candidate schools.

Officer candidates must have an academic background in surveying in civilian life; for NCO's and enlisted men this is desirable but not required.

Under the new federal service regulations of 1960, only men who have completed their studies in geodesy, geography, or geology can be accepted as career or reserve officers. They become captains after passing the second state examination. Additional information is furnished on the career possibilities for officers. Career officers must obligate themselves for a minimum of eight years.

NCO's and enlisted men come from the following professional groups: survey technicians, photogrammetric technicians, cartographic (also technical) draftsmen, offset printers, etc. Minimum term of enlistment is three years.

ALLGEMEINE VERMESSUNGS-NACHRICHTEN (German) AMS-GL-B664.7002, No. 1 (1961)-ms

839 *Formulae for Approximate Computation of Long Geodetic Lines* (Formeln zur Berechnung langer geodaetischer Strecken). Karl Hubeny

A system of formulae is derived permitting us to carry out, in a simple manner, forward and inverse computations over arbitrary distances with a limited accuracy (a few meters).*

Their shortness is emphasized as well as the fact that the coefficients lend themselves for tabulation.

On the basis of the two formulae

$$s = [A_s]\sigma + [B_s]\cos\sigma\sin\sigma$$
$$l = \lambda + [A_l]\sigma$$

the above two problems of forward and inverse computations are discussed and all intermediate formulae given. The azimuth and the distance have been obtained by a series of approximations of parameters which appear in the final equations of these quantities.

The final formula for the distance is of the form

$$s_2 - s_1 = s_{12} = [A_s](\sigma_2 - \sigma_1) + [B_s](\cos\sigma_2\sin\sigma_2 - \cos\sigma_1\sin\sigma_1)$$

The final formulae for the azimuth are the following

$$\operatorname{tg}\tfrac{1}{2}(\alpha_1 + \alpha_2) = k_1\operatorname{tg}\tfrac{1}{2}\lambda_{12}$$
$$\operatorname{tg}\tfrac{1}{2}(\alpha_2 + \alpha_1) = k_2\operatorname{tg}\tfrac{1}{2}\lambda_{12}$$

where $k_1 = \dfrac{\cos\frac{1}{2}(\beta_1+\beta_2)}{\sin\frac{1}{2}(\beta_2-\beta_1)}$, $k_2 = \dfrac{\sin\frac{1}{2}(\beta_1+\beta_2)}{\cos\frac{1}{2}(\beta_2-\beta_1)}$

A small example testing the efficiency of the approximate formulae is presented. The result proves to be within the required accuracy of 5 meters for a line of approximately 15,000 km.

ALLGEMEINE VERMESSUNGS-NACHRICHTEN (German) AMS-GL-B664.7002, No. 11 (1960)-mc

840 *The Accuracy of Precise Leveling with the Zeiss Ni 2* (Zur Genauigkeit von Praezisionsnivellements mit Zeiss-Ni 2). J. Wolter

A study is presented concerning the accuracy obtainable in precise leveling with a Zeiss Ni 2 automatic level.

In 1959, two lines and one short loop were measured by the North Rhine–Westphalia State Survey Office as a section of the main leveling net. The observing arrangement which is described in detail is based on the idea that the bubble is centered uniformly in the direction of the measurement. The pointing of the telescope alternates: on one position to the backsight rod and on the next position to the fore-sight rod. This is done in order to give the total error for a leveling line, caused by the compensating error, the character of an accidental error.

In these measurements, a series of automatic Zeiss Ni 2 levels was available. In order to prove that precise leveling can be carried out with great accuracy with each of these instruments, an instrument was selected whose compensating error for the corresponding obliqueness of the vertical axis, i.e. the same adjusting error, was greatest.

For leveling forward and backward over a line of 1 km. the following accidental mean errors μ_0 were obtained: ± 0.28 mm., ± 0.29 mm., and ± 0.27 mm. These results show that the lower limiting value of ± 0.5 mm. set by the manufacturer for the mean error in precise leveling over a line of 1 km. can be reduced under normal conditions to nearly half.

ZEITSCHRIFT FUER VERMESSUNGSWESEN (German) AMS-GL-B644.7001, Vol. 85, No. 12 (1960)-mc

841 *Test Measurements on the Zeiss Precision Stereocomparator* (Probemessungen am Zeiss-Praezisionsstereokomparator). G. Lehmann

In July 1960, the Zeiss Company offered the Institute for Photogrammetry and Engineering Surveys at Hannover Technical University the opportunity of making test measurements on its newly developed precision stereocomparator. Because of the lack of sufficient survey data, the tests were only preliminary in nature.

Three types of measurements were made:

I—A pair of previously checked grid plates was measured. The error for one setting of a grid point (internal accuracy) was $\pm 2\mu$. This slightly large figure was due to certain inadequacies of the test model which, in the meantime, have been corrected. The mean coordinate error m_k, (external accuracy), containing the setting errors, the errors of the test grid, and the comparator errors proper, was computed from the residual errors of the Helmert and affine transformation of the comparator coordinates to the theoretical values of the grid points. m_k is $\pm 3\mu$ and is the same for both transformations. No systematic error was found for the comparator.

II—Measurement of marked points of comparison in a single model. Measurements were made in a stereo pair taken originally for other purposes and accepted as free of errors. The mean setting error (internal accuracy) for one setting only of a marked point was $\pm 1.6\mu$. The

* See also Abstract No. 729, Vol. V, No. 4—Editor (Not reprinted in SURVEYING AND MAPPING.)

mean coordinate error m_k (external accuracy), containing the setting and comparator errors as well as the photo errors, was derived from the differences between the transformed comparator coordinates and the theoretical value of the terrestrial coordinates of 37 comparison points; it is ±4.7 cm. ≅ 5.9μ and the error m_h in the elevation is ±14.2 cm. ≅ 0.085% of h.

III–Measurement of marked control points in 12 models of an area subject to reallocation of agricultural holdings and in strip triangulations.

From the residual errors of the Helmert transformations in 12 individual models, the following mean coordinate errors m_k were obtained: for the C8 stereoplanigraph: 8.1 cm. ≅ 9.3 μ and for the comparator: 5.5 cm. ≅ 6.3 μ.

In the triangulation strips x, y, and h were adjusted separately by means of a five-term polynomial. The mean coordinate error from six models was ±5.3 cm. ≅ 6.1 μ. This speaks well for the high quality of the comparator as well as of the camera and the State net from which the coordinates were taken.

Whether these very favorable results will be the general norm, or are accidental in nature, will have to be established from further exhaustive investigations.

ZEITSCHRIFT FUER VERMESSUNGSWESEN (German) AMS-GL-B664.7001, Vol. 85, No. 12 (1960)-ms

842 *Adjustment of the Fictitious First-order Fill-net of the Transdanubian Area* (A dunántúli kitöltőhálozat fiktiv elsörendü hálozatának kiegyenlitése). Dr. E. Hönyi

An important phase of the computations of the new Hungarian triangulation has been completed: the final adjustment of the fictitious first-order fill-net of the Transdanubian area, based on the first-order triangulation points of the principal net.

From small triangles (with sides about 8 km. long) and with the help of selected, old higher-order points, termed the "dominant points", a fictitious first-order net was computed, consisting of triangles with side lengths of about 30 km. Using the fictitious angles, the final coordinates of the "dominant points" were determined by two different methods.

With the first method, 20 dominant points based on 21 points of the principal net were adjusted in one block. The number of unknowns was 40 (orientation unknowns were eliminated). The total number of directions measured was 156, including 96 redundant directions. The mean-square error of a direction was ±1.73″. The mean-square error of an angle was $1.73'' \sqrt{2} = \pm 2.45''$. If we compare these results with the mean-square error of an angle (0.626″) computed by the Ferrero formula for the small triangles in the 59 fictitious triangles, and the mean-square angle error of the net (0.662″) obtained from the adjustment of the groups of small triangles, we can see the great strain in the loop.

The second method, suggested by Dr. Vilmos Vincze, was applied as follows: the adjustment of the 20 dominant points was carried out in such a manner that out of the 59 fictitious triangles five new, larger groups of fictitious triangles were formed around point M. Thus, from the fictitious angles, new second-order fictitious angles were derived with correlate-adjustment, independent from the fixed condition of the loop. These groups of fictitious triangles overlap. With these fictitious angles the coordinates of point M were determined by variation of coordinates, based on the definitive coordinates of the previously selected five first-order points. Having determined the definitive coordinates of the newly-formed point M, the five groups of fictitious triangles were adjusted by variation of coordinates, accepting as definitive coordinates those of the first-order points of the loop and the point M. Along the border between the groups, the points received two sets of coordinate values. The arithmetical mean of the two values was accepted as the final result.

Two diagrams and three tables are attached. Diagram 1 shows the 21 first-order points of the loop, the 20 dominant points, the horizon closing errors obtained from the fictitious angles of the dominant points, and the discrepancies between the adjusted and fictitious angles of the principal net. Diagram 2 shows the net divided into five groups around point M. Table I gives the mean coordinate errors obtained from the two different adjustment methods; Table II the differences between the coordinates determined by the two different methods; Table III the data of the adjustment by the Vincze method. This latter requires about 30% less time than the adjustment in one block and could be especially recommended for the adjustment of larger nets.

GEODÉZIA ÉS KARTOGRÁFIA (Hungarian) AMS-GL-B661.7200, Vol. 12, No. 1 (1960)-af

843 *First Application of the Tellurometer in Hungary* (Próbamérések a telluriométerrel Magyarországon). E. Regöczi

Test measurements were made with an M/Ra-1 type Tellurometer (12–14 September 1959) on the Mátészálka National Base line and in a portion of the first-order net. This was the first time the Tellurometer was used in Hungary.

The distance of 2,640 m. between the south end point of the base line (*DVP*) and the south section point (*SD*) was measured three times; the distance of 5,280 m. between *DVP* and the center section point (*SK*) was measured once, and the 29,480 m. long side of the first-order triangle Ricsóhegy-Tarpai Nagyhegy was measured three times.

The differences between the results obtained by classical methods and the Tellurometer measurements are as follows:

DVP–SD: –13.8 cm. (±2.93 cm.); –12.8 cm. (±3.46 cm.); –3.2 cm. (±3.70 cm.)

DVP–SK: –34.9 cm. (±10.66 cm.)

Ricsóhegy–Tarpai Nagyhegy: 1.8 cm. (±5.40 cm.); –18.0 cm. (±22.6 cm.); –21.2 cm. (±3.10 cm.)

Figures in parenthesis represent the mean errors. The negative sign indicates that the distance measured by classical methods was the greater.

It is to be noted, that the instrument was used in accordance with the specifications of the manufacturer and the original correction tables were used in the computations.

A final opinion on the usability of the Tellurometer cannot be given at this time, because there is a need for a considerable series of testing.

Geodézia és Kartográfia (Hungarian) AMS-GL-B661.7200, Vol. 12, No. 1 (1960)-af

844 *Results Obtained by the Columbus Group in the Determination of the Figure of the Earth and Its Gravity Field.* W. A. Heiskanen

As a contribution to the Jubilee Volume of Professor Gino Cassinis, the author presents a brief summary of the results obtained by the world-wide gravity program which he set up in 1950 at the Ohio State University for the determination of the figure of the earth.

The work accomplished by the Columbus Group in connection with the above program is listed in broad outlines. It consists mainly of preparation of basic gravity material from various sources, computation of the quantities N, ζ and η, theoretical studies and other pertinent computations.

The main problem of physical geodesy at the present time is to obtain more material. Since gravity observations at sea can now be carried out from surface vessels and observations above the continents even from airplanes, the author expresses the hope that it might not be too long before we are close to the ideal situation of having a sufficient gravity anomaly field. Then the error of the undulation N would hardly exceed about two meters except in some high mountains.

The article is supplemented by four illustrations (mean free-air gravity anomalies of $5° \times 5°$ squares; gravity anomalies developed in spherical harmonics for flattening $\alpha = 1:297.0$; gravity anomalies developed in spherical harmonics for flattening $\alpha = 1:298.3$; and sum of the eight first Legendrians of the gravity anomalies for flattening values 1:297.0 and 1:298.3). An extended bibliography of reference studies is appended.

Bollettino di Geodesia e Scienze Affini (English) AMS-GL-B641.2200, Vol. 19, No. 4 (1960)-mc

845 *Selected Events in the Progress of Determining Earth-Shape* J. De Graaff-Hunter

The author's contribution to the special number of the *Bollettino* (see below) honoring Gino Cassinis consists of presenting extracts with quotations from papers of leading scientists concerned with research in gravity reduction and application.

The clue to progress lay in Green's equation which was privately printed in 1828. It appears, however, that geodesists did not use it during the next hundred years. In Part I some notes about Green and Stokes are presented. There follows a rather long extract from Young's writings in which occurs what Stokes quoted as "Dr. Young's rule" although Young, apparently, did not call it so, nor did he establish it by a rigorous proof. Extracts from papers by Faye and Putnam follow, leading to the author's own investigations.

As President of a Special Study Group of the IUGG he concentrated on the treatment of gravity observations for the purpose of gaining information on the shape of the Earth's surface and indications of associated shallow mass anomalies.

His presidential address at Toronto, where he introduced the "Model Earth", led to investigating past research in this field and, in Part II, there follow his comments on the past and present.

He concludes that "the proper basis for geodesy is the external gravitational field. A standard or reference potential should be

adopted to which the family of level surfaces or spheroids apply. One of these can be an ellipsoid of revolution, by a suitable choice of the potential. But observations of regression of the orbital plane of artificial satellites show that the fourth zonal harmonic of nature is only 60% of that of the ellipsoid."

Bollettino di Geodesia e Scienze Affini (English) AMS-GL-B641.2200, Vol. 19, No. 4 (1960)-mc

848 *Generalization of Computational and Operative Procedures in Analytic Aerial Triangulation* (Generalizzazione dei procedimenti di calcolo ed operativi nella triangolazione aerea analitica.) Mariano Cunietti

In a general introductory section, the basic expression for the relation between aerial photogram and terrain is presented in the vectorial form and the analytic development of the problem is discussed.

There follows a general mathematical treatment of the analytic solution of the photogrammetric problem, i.e., determining the elements which fix the position of the photogram in space and coordinates of points on the ground. The analytic solution is carried out in two successive phases, first by determining the elements of orientation of the cameras and then by determining the points on the ground.

General considerations concerning the various operative possiblities which analytic aerial triangulation offers are discussed on the basis of formulae and supplemented by diagrams.

Bollettino di Geodesia e Scienze Affini (Italian) AMS-GL-B641.2200, Vol. 19, No. 4 (1960)-mc

851 *The 20th Polish Conference of Technical Sciences* (A XX. lengyel muszaki tudomanyos konferencia). T. Bence and Dr. E. Hönyi

The 20th Conference of Technical Sciences was held in June 1959, under the auspices of the Polish Geodetic Association. The subject of the Conference was "The New Polish Triangulation Net." Czech, Yugoslav, German, and Hungarian geodesists were among the 250 participants.

A brief comparison of the new Polish and Hungarian triangulations is given by the Hungarian delegates: Tivadar Bence, and Dr. Ede Hönyi in their report on the conference.

In the Polish triangulation the reconnaissance and the monumentation were carried out by different groups; they also used portable triangulation towers, but both parts were made of wood, whereas the observation stand of the Hungarian towers is made of iron. The Polish geodesists measure angles, not directions, because in this manner the tower has to remain motionless for a shorter period of time. This is an important aspect, because the Polish towers are less rigid than the Hungarian Illés-towers.

Cost analyses proved, that developing the net from small triangles is more economical.

The Polish geodesists follow a different computation method than the Hungarians. They do not compute a fictitious first-order net, but position the net by the Helmert method, based on the known first-order points.

The density of the Polish net is higher than that of the Hungarian net. The Poles carried out simultaneously the observations of the fill-net and the densification net. The average density is one station for every 6 sq. km. According to long-range plans, the Hungarian densification net will be completed by 1968.

Geodézia és Kartográfia (Hungarian) AMS-GL-B661.7200, Vol. 12, No. 1 (1960)-af

854 *Polish Large-scale Topographical Map* (Sytuacyjna Mapa Zasadnicza). Eugeniusz Lukasiewicz

According to the official definition of 1959, the contents of a large-scale map are adjusted to the basic economic requirements of the people, therefore, the title of the new map is the Large-scale Topographical Map.

All the features of the new map are carefully listed and examined, and it is concluded that for populated, municipal and district areas the scale of the map should be 1:5,000, while for industrial centers it should be 1:10,000. The mathematical factors of the new map are the same as those of the national coordinate system, using the Gauss-Krueger projection, the Krasovsky ellipsoid, and Pulkovo as the initial point. The 1:10,000 sheets are compiled directly from the International Map of the World. Each map sheet of the latter provides 144 Polish 1:10,000 sheets, having 20′ latitude and 30′ longitude, and numbered by Arabic numerals starting from the NW corner of the International Map of the World. The entire Polish territory will be represented on approximately 310 sheets and 75,000 sheets of the 1:10,000 and 1:5,000 maps respectively. The grid of 1:5,000 sheets is constructed of isosceles trapezoids. The deformation and changes in length of neat lines will be insignificant, for they will not exceed 0.01 m.

Przeglad Geodezyjny (Polish) AMS-GL-B676.7100, Vol. 32, No. 2 (1960)-ma

855 *Contour Lines on the 1:5,000 and 1:10,000 Base Maps* (Warstwice na Mapach Podstatowych 1:5,000 and 1:10,000). Bronislaw Slupeczanski

The following contour intervals can be used for basic maps: 2.5, 1.25, 1.00, 0.5, 0.625, or 0.25 m. For the already produced 1:25,000 maps, the 2.5 m. contour interval had been used. The minimum value of 0.5 m. for contour intervals for the 1:5,000 and 1:10,000 basic maps should be accepted.

In the Soviet Union, no value is established for contour intervals for 1:5,000 and 1:10,000 maps, for these maps have the purpose of representing certain portions of the country and not to serve as basic maps. The Polish 1:10,000 map must cover the entire territory of the country.

In Poland 18 sheets of the 1:5,000 map had been produced in 1925–26. The contour interval was 0.5 m. For the new 1:5,000 and 1:10,000 it is suggested that the basic contour interval be equal to 2 m. and the auxiliary 1 and 0.5 m.

PRZEGLAD GEODEZYJNY (Polish) AMS-GL-B676.7100, Vol. 32, No. 3 (1960)-ma

856 *Some Remarks on Relief Representation on 1:10,000 and 1:5,000 Topographical Maps* (Kilka uwag na temat uwspólksztaltniania rzeźby terenu na mapach topograficznych w skali 1:10,000 i 1:5,000). Wojciech Mazurczyk

The greatest part of Polish territory consists of unstable rocks and highly forested areas. That makes Polish geomorphological forms quite peculiar, which requires much better and more specific map representation by contour lines. An analysis of the present day methods of aerial photography is presented. It is pointed out that the accuracy of representing the forested areas of Poland is two to three times smaller than of other areas.

To cope with this problem more and better trained specialists are needed, who can draw proper contour lines from aerial photographs and identify correctly all hydrographic data.

An analysis of the angle of elevation (α) and the following table is presented:

α	1:10,000	1:5,000
1 °	3.59	7.18
2 °	1.87	3.74
3 °	0.82	1.64
10 °	0.49	0.98
15 °	0.37	0.74
20 °	0.31	0.62
25 °	0.28	0.56
30 °	0.25	0.50

Several suggestions are made concerning the problem of relief representation of high mountains and densely forested areas.

PRZEGLAD GEODEZYJNY (Polish) AMS-GL-B676.7100, Vol. 32, No. 10 (1960)-ma

857 *Geodesy and Cartography in the Soviet Advanced Schools* (Geodézie a kartografie na sovětských vysokých školach). Dr. Josef Boem

Geodetic and cartographic engineers in the USSR are graduating from the following three advanced schools: MIIGAiK (Moscow), NIIGAiK (Novosibirsk) and the Geodetic Faculty of Lwów Polytechnik.

MIIGAiK has the following four faculties: geodetic, photogrammetric, cartographic, and optico-mechanical. The dean of the Institute is Prof. Zakatov, his assistants are Prof. Durnev and Prof. Izotov. The faculties are headed by four docents: Bagratuni, Sukhov, Volkov, and Romanov. There are 22 professors and 67 associated professors. There are 23 chairs, each consisting of 5–20 teachers. The Chair of Geodesy, headed by Prof. Chebotarev, is the largest (20 teachers). The chairs of photogrammetry, mathematical cartography, advanced geodesy, engineering geodesy, astronomy and optics are headed by professors Drobyshev, Solov'yev, Zakatov, docents Murav'yev, and Kuznetsov and Professor Feofilov respectively. There is a library with some 300,000 books, as well as several laboratories. The study lasts 11 semesters.

The Ministry of Agriculture has its Cadastral Institute which offers courses in cadastral surveying. The greatest authority in cadastral surveying is the MIIZ (Moscow Institute of Cadastral Engineers—*Moskovskii Institut Inzhenerov Zemleustroystva*). The dean of the Institute is docent Kostaryev: Prof. Maslov and Prof. Yurovskiy are heads of the two faculties. There is a similar Institute in Omsk. The study in both Institutes lasts 11 semesters.

Lomonosov University, Moscow, offers cartographic courses at its Geographic Faculty. The 11 semesters' study leads to the degree in geographic-cartographic sciences. A graduated student has a title of geographic-cartographic engineer. The Geographic-cartographic chair, headed by Prof. Salishchev, is excellently equipped. Its arm is the *Research Institute on Photogrammetrical Methods*.

GEODETICKY A KARTOGRAFICKY OBZOR (Czech) AMS-GL-B662.7200, No. 11 (1960)-ma

858 *Space Vehicles and Astrophysics* (Kosmicheskie korabli i astrofizika). V. G. Fesenkov

The possibilities of carrying out astronomic observations from the first manned space vehicle are discussed. It is assumed that the ground-controlled space vehicle will orbit around the Earth at an altitude of 500–600 km., along an almost circular orbit, having an inclination of 65° to the equatorial plane.

The problem of determining the distribution of ozone content at various altitudes by measuring the extinction of sunlight before sunset, when the Sun approaches the horizon line, is discussed in detail.

For such a purpose, the use of a camera with a telephoto lens is suggested. It should have a focal length of about 1 m., and should be specially equipped with a set of filters.

The following problems were briefly described: observations related to the emission spectra of the ionosphere in the dark portion of the globe, the nature of counterglow, and the structure, polarization, and emission properties of the corona.

Priroda (Russian)—L.C. Q4 P8, 1960-ma

859 *Dream of Astronauts* (Mechta kosmonavtov). A. Sternfeld

The most favorable time for departure of a space-ship from the Earth to Mars is when Mars is 44° ahead of the Earth, that is 96 days before the Earth's opposition to Mars. Therefore, the dates of 3 February 1963, 8 March 1965, and 6 August 1971 are of great importance.

A flight along a semi-elliptical trajectory can be assured with a minimum take-off speed of 11.6 km/sec and with a minimum fuel consumption. Under these conditions, it will take astronauts 259 days to reach Mars, covering a distance of 586 million km., which is 7.5 times greater than the mean distance between the Earth and Mars in opposition.

In the future, when more powerful rockets with takeoff speeds of 16.7 km/sec would be developed, the trip to Mars along a parabolic trajectory would take only 70 days.

Ekonomicheskaya Gazeta (Russian)—L. C. S1 02530 No. 180 (1960)-ma

860 *Celestial Populated Islands* (Obitaemiy Ostrov v efire). N. Varvarow

For a round trip to the Moon a space-ship, using both the atmosphere and rocket engines for deceleration in re-entry, would require a total speed of 20 km/sec. That is, for take off from the Earth little less than 11.2 km/sec, for deceleration in landing on the Moon 3.3 km/sec, and for take off from the Moon 2.4 km/sec. A similar trip to Mars would require a total speed of about 30 km/sec. A lunar space-ship—with a 10-ton payload, using chemical fuel with an exhaust velocity of 4,000 m/sec—would weigh about 10,000 tons. A similar Martian ship would weigh at least 180,000 tons. Even with the use of optimum chemical fuel, a lunar ship would weigh not less than 3,000 tons, and a Martian ship more than 25,000 tons. At present, space technology is not capable of building such space vehicles.

Tsiolkovskiy has suggested an interplanetary station to serve as a launching base for interplanetary flights. This possibility is being investigated by Soviet scientists. Space vehicles launched from an interplanetary station will not have to contend with the atmoshpere of the Earth, therefore, their shapes can be different and their structural weight smaller.

Round trip travel to other planets will be of quite a long duration, about two years to Venus and about three years to Mars.

Ekonomicheskaya Gazeta (Russian)—L. C. SL 02528 No. 170 (1960)-ma

863 *On the Problem of Developing Second- and Third-order National Geodetic Nets by Traversing* (K voprosu o razvitii gosudarstvennykh setei 2– i 3–go klassov metodom poligonometrii). B. A. Litvinov

It is recommended that the second-order traverse be constructed, within the loops of the first-order triangulation, in 40-km. long arcs, thus forming series of quadrangular loops with 160-km. long perimeters. The following requirements are prescribed: side length ~ 10 km., measured with an accuracy of 1:200,000; mean-square error of angle measurement should not exceed ± 1″.

A check of the new method has been carried out within a loop of the first-order triangulation net in the USSR. The net was simultaneously adjusted by the method of conditional adjustment, by the method of closure and by the method of approximation. The results showed that the accuracy obtained was the same as that obtained by the second-order triangulation.

In a similar manner a third-order net can be constructed within the second-order net.

Geodeziya i Kartografiya (Russian) AMS-GL-B675.2214, No. 3, (1960)-ma

864 *Comparison of the Accuracy of Angular,*

Linear, and Linear-angular Triangulations (Sravnenie tochnosti uglovoi, lineinoi i lineiuglovoi triangulatsii). K. L. Provrov

For the comparison of values of the orthogonal (m_t) and transversal (m_u) mean-square errors, a 200-km. long triangulation chain has been examined. The chain consisted of 16 isosceles triangles, in all cases rigorously computed (mean-square error of angle 0.7″ and that of a measured side 0.1 m.).

Triangulation		Mean-square error (m) Connecting angles of triangles		
		60°	30°	15°
Angular	m_t	±0.65	±1.95	±4.20
	m_u	0.65	0.65	0.65
Linear	m_t	0.20	0.20	0.21
	m_u	1.11	6.9	17.7

Triangulation		Mean square error (m) Connecting angles of triangles		
		60°	30°	15°
Linear-angular				
All angles and triangles measured	m_t	0.16	0.18	0.18
	m_u	0.57	0.64	0.64
Connecting angles not measured	m_t	0.16	0.18	0.18
	m_u	0.73	0.78	0.78
Intermediate sides not measured	m_t	0.23	0.35	0.39
	m_u	0.73	0.67	0.64
Connecting angles and intermediate sides not measured	m_t	0.25	0.35	0.39
	m_u	0.86	0.81	0.79

The advantages and disadvantages of each method are presented.

Izvestiya Vysshikh Uchebnykh Zavedeniy, Geodeziya i Aerofotos"yemka (Russian) AMS-GL-B675.2215, No. 1 (1960)-ma

865 *Comparison of Projections Used for Modern Topographic Maps* (Sravneniye proyektsiy ispol'zuyemykh dlya sovremennykh topograficheskikh kart). L. A. Vakhrameyev

A discussion is presented concerning the advantages and disadvantages of three conformal projections which are most widely used for modern topographic maps: the Gauss-Krueger, Lambert, and stereographic projections. Formulae are developed for the computation of rectangular coordinates in each of these projections. A comparison shows that when origin and standard meridian of a given zone coincide, the formulae are very similar and differ only in terms of the third order.

An investigation of the angular and linear distortions in each of the projections discussed shows that these distortions are smallest in the stereographic projection (approximately 5″ and 1/4,000 respectively at a distance of 200 km.). However, the Lambert and Gauss-Krueger projections have the advantage over the stereographic that much larger areas can be represented, while the Gauss-Krueger has the additional advantage over the other two of the full identity of all its zones. Taking this into consideration, it may be assumed that in the future the Gauss-Krueger projection will be used for topographic maps all over the world.

Izvestiya Vysshikh Uchebnykh Zavedeniy Geodeziya i Aerofotos"yemka (Russian) AMS-GL-B675.2215, No. 4 (1960)-ap

866 *Measuring Stereoscope* (Izmeritel'niy stereoskop). F. V. Drobishev

The Moscow Institute of Engineers of Geodesy, Aerial Photography, and Cartography has designed and manufactured a high-precision photogrammetric stereoscope suitable for map compilation from aerial photographs, various parallaxes and photointerpretation.

A detailed description of the instrument is presented. It consists of a plate along which aerial photographs are moved by a specially designed carriage. The stereoscope is equipped with a binocular microscope with a magnifying power of 3.5 or 7.5 times.

Izvestiya Vysshikh Uchebnykh Zavedeniy, Geodeziya i Aerofotos"yemka AMS-GL-B675.2215, No. 5 (1960)-ma

867 *Conclusions of the Deliberations of the Cartographic Council* (Zaključci savetovanja o kartografiji). Union of Geodetic Engineers and Surveyors

Over 200 delegates from Yugoslavia attended and took part in the Cartographic Council deliberations of March 1959.

It was recommended to continue with the construction of the 1:5,000 and 1:10,000 basic national map. The data of the large-scale numerical national survey can be used for the construction of these maps.

It is recommended that in the planning of large-scale manuscripts the manner of reproduc-

tion be also taken into consideration. So, either the photomechanical or engraving process can be applied. Plastic materials for reproduction of large-scale maps are fully recommended.

Cartographers should be better paid, otherwise, they are forced to accept other jobs. For instance, out of 82 qualified cartographers of the Cartographic Establishment (*Zaved za kartografiju*) only 8 are still there.

Foreign currency should be granted in order to purchase modern instruments and cartographic equipment.

GEODETSKI LIST (Serbian) AMS-GL-B658.7100, Vol. 13, Nos. 10 and 11 (1960)-ma

Ordnance Survey Landmark *

For the first time in the history of the country the whole of Great Britain is now covered by a single series of Ordnance Survey one inch to one mile maps in which all sheets are similar in projection, size and style. This important milestone was reached when the last six sheets of the Seventh Series were published on 5th August, 1961.

The Ordnance Survey was founded in 1791. Its first task was to produce maps to help in stemming the threatened invasion from France. The first one-inch sheets to be published were those of Kent in 1801 and Essex in 1805. They were made primarily for this purpose and were published in black and white only. But the need for maps in peace as well as in war was soon realized, and the survey was carried northwards, reaching a line from Preston to Hull by 1840. This year saw the commencement of a new survey at six inches to the mile, beginning in Northern England and continuing into Scotland and Southern England. Thereafter the field work for the one-inch map was done at the six-inch scale, instead of the original two-inch. This "New Series" one-inch was completed in 1892, and in the next year work was begun on the Third Edition, in which contours and colours were used for the first time. The Fourth Edition, known as the "Popular," was commenced in 1919, to be followed by the Fifth, for which work started in 1928. This edition covered only Southern England, and carried hill shading in addition to contours. After the last war, there was produced a Sixth "New Popular" Edition for England and Wales, while Scotland retained the "Popular." Both incorporated all available corrections.

It had become apparent, however, that the drawings of the one-inch map could no longer be effectively maintained to an acceptable standard, and the map would have to be redrawn. Accordingly, the Seventh Series was designed as a completely new map, of which the first sheets, Hereford and Chester, appeared in 1952. Working to a programme of about 20 sheets a year it has taken nine years to complete the 190 sheets of the series from 1, which covers Yell and Unst in the Shetlands, to sheet 190 covering Falmouth in Cornwall.

This is an era of rapid change, so the work of nine years ago is soon out of date and revision of the maps could not await completion of the series. Nine fully revised sheets have already been published and many others have been reprinted incorporating major changes including the new roads. Fully revised sheets are now being produced at a rate of about 12 sheets per year, but whenever any sheet is reprinted, which occurs on an average of about once every five years, a special revision of the major road information is made so that all maps are up to date in this respect when they are prepared for printing, even though they may not be otherwise revised. Sheets are chosen for full revision in accordance with the amount of change. Thus, though some may not be fully revised for 20 years or so, others may warrant full revision after only some 5 to 10 years.

The Ordnance Survey has many other mapping tasks in hand including a new series of maps at the scale of a quarter inch to one mile, as well as the re-survey or revision of the large scale plans at 25 inches and 50 inches to one mile. Nevertheless, the one inch map remains the Ordnance Survey's "best seller" with annual sales of over one million copies.

* An editorial note quoted from *The Chartered Surveyor*, The Journal of the Royal Institution of Chartered Surveyors, Vol. 94, No. 3, September 1961, page 113.

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Map Information

This department was inaugurated for the purpose of bringing to the attention of the members information pertaining to the availability of maps, surveys, etc., with particular emphasis on how such material can be procured. It is believed that through an interchange and dissemination of such information maximum benefits will accrue to the surveying and mapping profession.

—EDITOR

Topographic Maps

THE FOLLOWING quadrangle maps were published or became available for distribution by the U. S. Geological Survey between June 1 and August 31, 1961. The list includes newly compiled maps; revised maps on which contours and drainage usually are unchanged, but the works of man are brought up to date; and series-converted maps which are 15-minute maps produced from four 7½-minute maps of the same area. The maps are new unless otherwise designated by numerical superscript.

The quadrangle name (in capital letters) is followed by the name of the county (in upper- and lower-case letters) that contains the place or feature for which the quadrangle is named.

All maps are available with or without the green overprint that indicates woodland. These maps show the shape and elevation of the land surface (represented by contour lines, printed in brown—except those marked with the letter (P), which are planimetric); water features (in blue); works of man, including cities, towns, and scattered habitations, schools, churches, railroads, roads and boundaries, place and feature names (in black); and woodland areas (in green). Principal roads are shown by a red overprint. In areas that have been covered by Bureau of Land Management surveys, township and section lines are shown. The State rectangular coordinates and the UTM 1,000-meter grid systems are indicated in the margins of the maps. An information folder further describing topographic maps is available on request.

Standard quadrangle maps may be obtained for 30 cents per copy. A discount of 20 percent is allowed on orders amounting to $10 or more at the retail price; a discount of 40 percent is allowed on orders amounting to $60 or more. Orders should be addressed to the U. S. Geological Survey, Washington 25, D. C., (or Denver 15, Colorado, for maps of areas west of the Mississippi River).

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* Indicates 15-minute quadrangles; all others are 7½-minute quadrangles.
[1] Indicates a revised map.
[2] Indicates a series-converted map.
† Indicates availability in either a contour or a shaded relief edition.
‡ Indicates preliminary black and white edition.

Alabama
ATMORE—Escambria
BARNETT CROSSROADS—Escambia
FLOMATON—Escambia
HUXFORD—Escambia
POLLARD—Escambia
WALLACE—Escambia

Alaska
McCARTHY C-8*
MOUNT HAYES B-5*
SLEETMUTE C-3*
SLEETMUTE D-2*
SLEETMUTE D-5*
SLEETMUTE D-6*
SLEETMUTE D-7*
TYONEK A-3*
TYONEK B-2*
TYONEK D-4*
TYONEK D-5*
TYONEK D-6*

Arizona
GUTHRIE*—Greenlee
SENATOR MOUNTAIN*—Mohave
WHITE HILLS*—Mohave

Arizona-New Mexico
DUNCAN*—Greenlee

Arkansas
BUSSEY—Columbia
COLLINS—Drew
COLLINS*[2]—Drew
COLLINS NW—Drew
COMINTO—Drew
LINE—Ashley
MACEDONIA—Columbia
MIST—Ashley
MIST*[2]—Ashley
MIST NW—Drew
SELMA—Drew
SNYDER—Ashley

California
AETNA SPRINGS—Napa
BANNING*[2]—Riverside
BLISS RANCH—Madera
BOONVILLE*—Mendocino

BORREGO*2—San Diego
BUCKSNORT MTN—San Diego
CALEXICO*2—Imperial
CALIENTE MOUNTAIN—San Luis Obispo
CALISTOGA—Napa
CHOWCHILLA—Madera
CLARK LAKE NE—Riverside
CLEARLAKE HIGHLANDS—Lake
CLEARLAKE OAKS—Lake
COACHELLA*2—Riverside
COYOTE WELLS*2—Imperial
DESCANSO—San Diego
EL NIDO—Merced
FERNDALE*2—Humboldt
GLAMIS*2—Imperial
GUINDA—Yolo
JERICHO VALLEY—Lake
LA COSTA VALLEY1—Alameda
LAKE BERRYESSA—Napa
LAKEPORT—Lake
LAS YEGUAS RANCH—Kern
LOMPOC*2—Santa Barbara
LOWER LAKE—Lake
MIDDLETOWN—Lake
MOUNT LAGUNA—San Diego
ORNBAUN*—Mendocino
POTRERO—San Diego
SANTA MARIA*2—Santa Barbara
SIMMLER—San Luis Obispo
SURF—Santa Barbara
TAYLOR CANYON—San Luis Obispo
UPPER LAKE—Lake
VALYERMO*2—Los Angeles
VENTURA*1—Ventura
WILSON VALLEY—Lake

Colorado

BRISTOL HEAD*—Mineral
CALAMITY MESA1—Mesa
FLORENCE—Fremont
FLORISSAN*—Teller
GATEWAY*2—Mesa
HORSE RANGE MESA1—San Miguel
JUANITA ARCH1†—Mesa
PARADOX*2—Montrose
SLICK ROCK*2—San Miguel

Florida

CHERRY LAKE—Madison
PINETTA—Madison
ST. AUGUSTINE—St. Johns
ST. AUGUSTINE BEACH—St. Johns
TARPON SPRINGS—Pinellas
WINTER HAVEN—Polk

Georgia

CLAXTON1—Evans
DAISY1—Evans
DEANS CROSSING1—Evans
DORCHESTER1—Liberty
EDEN1—Effingham
GLENNVILLE1—Tattnall
GLENNVILLE NE1—Long
GLENNVILLE SW1—Long
GLISSONS MILLPOND1—Evans
HINESVILLE1—Liberty
LANIER1—Bryan
LETFORD1—Bryan
LIMERICK NW1—Liberty
MELDRIM1—Effingham
MELDRIM SE1—Chatham
MELDRIM SW1—Bryan
RICHMOND HILL1—Bryan
TAYLORS CREEK1—Liberty
TRINITY1—Liberty
WARTHEN NE—Washington
WILLIE1—Liberty

Georgia-South Carolina

LAVONIA—Franklin

Georgia-Tennessee

HEMP TOP—Fannin

Hawaii

HONOLULU1—Honolulu
KANEOHE1—Honolulu
KEALAKEKUA—Hawaii
WAIPAHU1—Honolulu

Idaho

BUHL*—Twin Falls
GARDEN VALLEY*—Boise
YALE*—Cassia

Illinois

BONE GAP—Edwards

Indiana

ALEXANDRIA—Madison
CARLOS—Randolph
DEERFIELD—Randolph
GARY1—Lake
GASTON—Delaware
GOSHEN—Elkhart
HAGERSTOWN—Wayne
INDIANAPOLIS WEST1—Marion
JASPER1—Dubois
KOKOMO WEST—Howard
MITCHELL1—Lawrence
MODOC—Randolph
MOUNT PLEASANT—Delaware
PORTAGE1—Porter
WHEELING—Delaware
WINDFALL—Tipton

Indiana-Illinois

KEENSBURG—Wabash
NEW HARMONY—Posey
SOLITUDE—Posey

Indiana-Kentucky

LANESVILLE1—Harrison

Indiana-Ohio

COSMOS—Darke
SPARTANBURG—Randolph
WHITEWATER—Wayne

Kansas

DEERFIELD—Kearny
DEERFIELD NE—Finney
DEERFIELD SE—Finney
DEERFIELD SW—Kearny
HUTCHINSON—Reno
MAYETTA—Jackson
PAWNEE ROCK—Barton

Kentucky

CRESTWOOD1—Shelby
FISHERVILLE1—Jefferson
WATERFORD1—Spencer

Louisiana

ASHTON BRIDGE—East Carroll
CAMERON FARMS—Cameron
GUY1—Allen
PINE CHAPEL1—Allen
VILLE PLATTE*—Evangeline
VINTON—Calcasieu

Louisiana-Texas

ORANGE*1—Orange

Maryland-Virginia

INDIAN HEAD*2—Charles

Michigan

ALLEN—Hillsdale

Minnesota

CROSS LAKE—Crow Wing

Mississippi

HORN ISLAND EAST—Jackson
HORN ISLAND WEST—Jackson

Mississippi-Alabama

CALEDONIA*—Lowndes
COLUMBUS*—Lowndes

Missouri

BRANCH—Camden
NIXA—Christian
OLEAN—Miller
PRESTON—Hickory

Missouri-Kansas

ATCHISON EAST1—Atchison

Montana

ALBERTON*—Mineral
DEER LODGE*—Powell
TARKIO*—Mineral

Nevada

EAST ELY—White Pine
ELY—White Pine
SHERMAN MTN.*—White Pine

Nevada-Oregon

JORDAN MEADOW*—Humboldt
McDERMITT*—Humboldt

New Jersey

BROOKVILLE1—Ocean
BROWNS MILLS1—Burlington
COLUMBUS1—Burlington
INDIAN MILLS1—Burlington
PEMBERTON1—Burlington
WOODMANSIE1—Burlington

New York

BELMONT*1—Allegany
FULTON*2—Oswego
SKANEATELES*2—Onondaga
WEEDSPORT*2—Cayuga
WESTDALE—Oneida

New York-Massachusetts

CANAAN1—Columbia

New York-Pennsylvania

ELMIRA*2—Chemung

North Dakota

BARRIE—Richland
DENHOFF—Sheridan
FLORENCE LAKE—Burleigh
HORSE LAKE—Sheridan

Ohio

ARMSTRONGS MILLS—Belmont
ATWATER—Portage
CARROLLTON—Carroll
CHERRY VALLEY—Ashtabula
CONVOY—Van Wert
DEFIANCE WEST—Defiance
DELPHOS—Van Wert
EAST TRUMBULL—Ashtabula
EVANSPORT—Defiance
GAGEVILLE—Ashtabula
KALIDA—Putnam
MALINTA—Henry
MALVERN—Stark
McCLURE—Henry
MENDON—Mercer
MIDDLEPOINT—Van Wert
MONROEVILLE—Huron
NAPOLEON EAST—Henry
NEW BAVARIA—Henry
NEW WASHINGTON—Crawford
NORWALK—Huron
OTTOVILLE—Putnam
SCOTT—Van Wert
SPENCERVILLE—Allen
TIFFIN SOUTH—Seneca
VAN WERT—Van Wert
WARREN—Trumbull
WATSON—Seneca
WETSEL—Van Wert
WINDHAM—Portage
WINDSOR—Ashtabula

Ohio-Pennsylvania

ANDOVER—Ashtabula

Ohio-West Virginia

APPLE GROVE—Mason

Oklahoma

CHEYENNE*—Roger Mills
HERD—Osage
NANOS—Osage
NELAGONEY—Osage
PAWHUSKA—Osage
SWEETWATER*—Beckham

Pennsylvania
AMBRIDGE[1]—Beaver
BEAVER SPRINGS—Snyder
BRADDOCK[1]—Allegheny
BRIDGEVILLE[1]—Allegheny
EMSWORTH[1]—Allegheny
GLENSHAW[1]—Allegheny
NEW KENSINGTON WEST[1]—Westmoreland
OAKDALE*[1]—Allegheny
POTTERSDALE—Clearfield
RICHFIELD—Juniata

Puerto Rico
ARECIBO[1]—Arecibo
FLORIDA[1]—Barceloneta
PLAYA DE PONCE[1]—Ponce
PUNTA CUCHARA[1]—Ponce

South Carolina
SENECA—Oconee

South Carolina—Georgia
HARTWELL NE—Anderson

Tennessee
CARDWELL MOUNTAIN—Warren
GASSAWAY—Cannon
SHORT MOUNTAIN—Cannon
SMITHVILLE—De Kalb

Texas
ALBA*[2]—Wood
BLANI[1]—Bell
BLUETT—Wise
BOONSVILLE—Wise
BRIDGEPORT EAST—Wise
CRESSLENN RANCH—Henderson
CRESSON*[2]—Hood
ECHOLS—Limestone
FORT HOOD[1]—Coryell
GIBTOWN—Jack
GOODLOW PARK—Navarro
GRAND SALINE*[2]—Van Zandt
IOWA PARK—Wichita
JUSTIN—Denton
LACOSTE NE—Medina
LA VERNIA SW—Wilson
LISSIE—Wharton
LOMETA*[2]—Lampasas
MABANK—Kaufman
MALAKOFF—Henderson
MARION—Guadalupe
McQUEENEY—Guadalupe
NEW BERLIN—Guadalupe
NEW BRAUNFELS EAST—Comal
NEW BRAUNFELS WEST—Comal
NOLANVILLE[1]—Bell
RHOME—Wise
ROUSTABOUT CAMP—Anderson
SAN FELIPE—Austin
SASPAMCO—Wilson
SEALY—Austin
SHELL MOUNTAINS[1]—Coryell
STAR*[2]—Mills
WILLIS—Montgomery

Texas-Oklahoma
CLARA—Wichita

Utah
COWBOY PASS*—Millard
FRISCO*—Beaver
MOAB 4 NE‡—Grand
MOAB 4 SE‡—Grand

Vermont-New Hampshire
HANOVER—Grafton

Virginia
BELMONT—Spotsylvania
BEAVERDAM—Hanover
BROKENBURG—Spotsylvania
BUCKNER—Louisa
CHAMPLAIN—Essex
CONTRARY CREEK—Louisa
CULPEPER—Culpeper
GUINEA[1]—Caroline
HOWERTONS—Essex
LADYSMITH—Carolina
MACHODOC—Westmoreland
MIDLAND—Fauquier
MINERAL—Louisa
MONTROSS—Westmoreland
MORATTICO—Lancaster
OCCUPACIA—Essex
SALEM CHURCH—Spotsylvania
TAPPAHANNOCK—Essex

Virginia-Maryland
QUANTICO*[2]—Prince William

West Virginia
CENTURY—Barbour
PHILIPPI—Barbour
SAINT GEORGE—Tucker

West Virginia-Ohio
MOUNDSVILLE—Marshall

West Virginia-Pennsylvania
LAKE LYNN—Monongalia
MAJORSVILLE—Marshall
OSAGE—Monongalia
WADESTOWN—Monongalia

Wisconsin
HARTLAND*[2]—Waukesha
PADDOCK LAKE—Kenosha

Wyoming
FULLER RESERVOIR[1]—Fremont
SANFORD RANCH—Natrona

In addition to the standard series of quadrangle maps, small-scale (1: 250,000) maps of areas in the United States and territories are being published and distributed. They may be purchased from the Geological Survey for 50 cents per copy. An index to the series is available on request.

Alaska
BARTER ISLAND†
CIRCLE†
FLAXMAN ISLAND†
HOLY CROSS†
KWIGUK†

Alaska-Canada
PRINCE RUPERT†

California-Arizona-Mexico
EL CENTRO

California-Mexico
SAN DIEGO

Georgia
BRUNSWICK

Georgia-South Carolina
AUGUSTA
SAVANNAH

Maine
BANGOR

Maine-Canada
EASTPORT

Massachusetts-New Hampshire-Connecticut-Rhode Island-Maine
BOSTON

Pennsylvania
HARRISBURG

Texas-Mexico
CRYSTAL CITY

Virginia-West Virginia
CHARLOTTESVILLE

West Virginia-Ohio
CHARLESTON

West Virginia-Ohio-Pennsylvania
CLARKSBURG

State maps are also being published and distributed. These maps may be purchased from the Geological Survey for the prices indicated below.

MAINE (shaded-relief). (30 by 44 inches) 1:500,000 scale. $2.00.

Lake Survey Charts

PUBLICATION of new editions of the following Lake Survey Charts has been announced by the United States Lake Survey of the Corps of Engineers, U. S. Army. Copies of these charts may be obtained from the U. S. Lake Survey, 630 Federal Building, Detroit 26, Michigan, at $1.00 per copy. Payment is required in advance by P. O. money order or draft, payable to the Treasurer of the United States. A catalog showing the areas described below is available free upon request.

3.—Lake Erie. Entire lake, at 1:400,000 scale.
37.—Lake Erie. Port Clinton, Ohio, and Colchester, Ont., to mouth of Detroit River, at 1:80,000 scale. Inset: Port Clinton, Ohio, at 1:10,000 scale.
41.—Detroit River. 3 miles south of Detroit River Light to Windmill Point, Mich., at 1:30,000 scale.
62.—St. Marys River. Lake Munuscong to Sault Ste. Marie, including Lake George, at 1:40,000 scale.
96.—Lake Superior. Little Girls Point, Mich., to Silver Bay, Minn., including Duluth, Minn., and Apostle Islands at 1:120,000 scale. Insets: Port Wing Harbor, Wis., and Two Harbors, Minn., at 1:10,000 scale, and Cornucopia, Wis., and Knife River, Minn., at 1:5,000 scale.
187.—New York State Barge Canal System. Cayuga and Seneca Lakes, N. Y., at 1:60,000 scale. Insets: Watkins Glen, N. Y., and Ithaca, N. Y., at 1:10,000 scale.
364.—Islands in the western end of Lake Erie, Pelee Island to the north, and the south shore of Port Clinton to Sandusky, Ohio, including Sandusky Bay. Inset: Put-in-Bay, Ohio, at 1:10,000 scale.
416.—Head of the Detroit River. Third Street to Gaukler Point, Lake St. Clair, at 1:30,000 scale.
524.—Entrance channel in Saginaw Bay. Lake Huron, and the entire Saginaw River to the junction of the Tittabawassee and Shiawassee Rivers, at 1:20,000 scale.
961.—Apostle Islands, Wis., and coast. Oronto Bay to Sand Island Light, Wis., including Chequamegon, Wis., at 1:10,000 scale.
966.—Duluth-Superior Harbor. Western end of Lake Superior, at 1:15,000 scale.
981.—Isle Royale, Mich., at 1:40,000 scale.

Public Land Survey Plats

THE FOLLOWING plats of public land surveys and resurveys were completed and accepted by the Bureau of Land Management between June 1 and August 31, 1961. The class and purpose of the survey is indicated. Copies of plats may be secured from the Bureau offices in the States or from the Director, Bureau of Land Management, Department of the Interior, Washington 25, D. C.

Alaska—Copper River Meridian

T. 58 S., R. 79 E.—Extension survey, Sec. 19
T. 59 S., R. 79 E.—Extension survey, Sec. 21

Arizona—Gila and Salt River Meridian

T. 6 S., R. 21 W.—Dependent resurvey and extension survey
T. 7 S., R. 21 W.—Dependent resurvey and extension survey
T. 6 S., R. 22 W.—Extension survey
T. 7 S., R. 22 W.—Dependent resurvey and extension survey
T. 8 S., R. 22 W.—Dependent resurvey, part of subdivisions
T. 2 S., R. 23 W.—Dependent resurvey and extension survey
T. 8 S., R. 23 W.—Dependent resurvey, part of subdivisions
T. 1 S., R. 24 W.—Dependent resurvey and extension survey
T. 2 S., R. 24 W.—Dependent resurvey and extension survey

Arizona—San Bernardino Meridian

T. 16 S., R. 21 E.—Dependent resurvey and extension survey
T. 16 S., R. 22 E.—Dependent resurvey, part of subdivisions

California—Humboldt Meridian

T. 7 N., R. 5 E.—Dependent resurvey and extension survey

California—Mount Diablo Meridian

T. 10 N., R. 21 E.—Dependent resurvey and extension survey
T. 10 N., R. 22 E.—Dependent resurvey and extension survey
T. 29 S., R. 39 E.—Dependent resurvey, part of subdivisions
T. 1 S., R. 5 W.—Tract surveys—Angel Island

California—San Bernardino Meridian

T. 2 N., R. 17 E.—Dependent resurvey and extension survey
T. 3 N., R. 17 E.—Dependent resurvey and extension survey
T. 1 N., R. 19 E.—Dependent resurvey, part of boundaries
T. 2 N., R. 19 E.—Dependent resurvey, part of subdivisions
T. 3 N., R. 19 E.—Dependent resurvey, part of subdivisions
T. 4 N., R. 19 E.—Dependent resurvey and extension survey
T. 5 N., R. 19 E.—Dependent resurvey and extension survey
T. 1 N., R. 20 E.—Survey, part of subdivisions
T. 2 N., R. 20 E.—Extension survey
T. 3 N., R. 20 E.—Survey, part of subdivisions
T. 4 N., R. 20 E.—Survey, part of subdivisions
T. 5 N., R. 20 E.—Dependent resurvey and extension survey
T. 1 N., R. 21 E.—Dependent resurvey and extension survey
T. 2 N., R. 21 E.—Dependent resurvey and extension survey
T. 3 N., R. 21 E.—Survey, part of subdivisions
T. 4 N., R. 21 E.—Dependent resurvey and extension survey
T. 3 N., R. 22 E.—Dependent resurvey, part of boundaries
T. 2 N., R. 23 E.—Dependent resurvey and extension survey
T. 3 N., R. 23 E.—Dependent resurvey and extension survey
T. 3 N., R. 24 E.—Dependent resurvey and extension survey
T. 1 N., R. 25 E.—Extension survey
T. 2 N., R. 25 E.—Survey, part of subdivisions
T. 1 S., R. 21 E.—Dependent resurvey, part of subdivisions

Colorado—Sixth Principal Meridian

T. 14 S., R. 79 W.—Dependent resurvey, part of subdivisions
T. 14 S., R. 82 W.—Dependent resurvey, part of subdivisions

Florida—Tallahassee Meridian

T. 17 S., R. 27 E.—Dependent resurvey and extension survey

Nevada—Mount Diablo Meridian

T. 26 N., R. 42 E.—Survey, part of subdivisions

Oregon—Willamette Meridian

T. 19 S., R. 4 W.—Dependent resurvey and subdivisional survey

South Dakota—Black Hills Meridian

T. 2 S., R. 5 E.—Dependent resurvey and subdivisional survey

Utah—Salt Lake Meridian

T. 2 N., R. 18 E.—Dependent resurvey and extension survey
T. 34 S., R. 2 E.—Skeleton survey
T. 35 S., R. 2 E.—Skeleton survey
T. 34 S., R. 3 E.—Skeleton survey
T. 34 S., R. 5 E.—Skeleton survey

County General Highway Maps

THE FOLLOWING county general highway maps were received by the U. S. Bureau of Public Roads, Washington, D. C., during the period from June 1 to August 31, 1961. Copies of these maps are sent to the Washington office as part of the continuing cooperative Federal-State highway planning program, as they are compiled or revised by the State highway departments.

Inquiries concerning prices, and orders should be sent to the respective State highway departments and not to the U. S. Bureau of Public Roads.

Alabama
BULLOCK
CRENSHAW
JACKSON

Florida
GLADES
SEMINOLE

Idaho
MINIDOKA
PAYETTE

Iowa
ADAMS
APPANOOSE
BOONE
CLARKE
FREEMONT
HAMILTON
IOWA
JONES
KEOKUK
LUCAS
MARION
MONONA
PAGE
POWESHIEK
SCOTT
TAYLOR
WAPELLO
WARREN
WINNEBAGO
WOODBURY

Kansas
HAMILTON
STANTON
WASHINGTON

Louisiana
WEST CARROLL

Michigan
BARAGA
GOGEBIC
HOUGHTON
IRON
KEWEENAW
ONTONAGON

Minnesota
McLEOD
NICOLLET

Mississippi
CALHOUN
CHICKASAW
NOXUBEE
WEBSTER

Missouri
DENT
KNOX
STONE
TANEY
WARREN
WAYNE

New Mexico
TAOS

Ohio
ATHENS
BROWN
BUTLER
MIAMI
WAYNE
WOOD

Oklahoma
ADAIR
BRYAN
CARTER
CRAIG
CREEK
DELAWARE
ELLIS
HARMON
JOHNSTON
MAYES
MURRAY
NOBLE
OSAGE
PONTOTOC
POTTAWATOMIE
ROGER MILLS
ROGERS
SEMINOLE
TEXAS
WAGONER
WASHINGTON

South Dakota
MINNEHAHA

Texas
ATASCOSA
BAILEY
BANDERA
BEXAR
COCHRAN
COMAL
CROSBY
DAWSON
FLOYD
FRIO
GAINES
GARZA
GUADALUPE
HALE
HOCKLEY
KENDALL
KERR
LAMB
LA SALLE
LUBBOCK
LYNN
McMULLEN
MEDINA
MILLS
PARMER
SWISHER
TERRY
WILSON
YOAKUM

Wyoming
HOT SPRINGS

Coast and Geodetic Survey Charts

THE FOLLOWING are new or basically changed nautical and aeronautical charts issued by the Coast and Geodetic Survey during the last period. Copies may be secured from Bureau offices and authorized agents in the United States and possessions, or from the Director, Coast and Geodetic Survey, Washington 25, D. C. Remittances covering cost should be made payable to Coast and Geodetic Survey, Department of Commerce. Complete catalogs of both nautical and aeronautical charts are issued free upon request.

Nautical

101—Potomac River, Md., Va., and D. C. Series consists of three sheets at scale 1:80,000 with 1:40,000 scale enlargement of Washington area. Major changes include: addition of new facilities; large-scale inset of Combs Cheek; new tide table; recent photographs of Washington waterfront; two-color illustrated front cover; and revision of hydrography in lower reaches of the river from recent basic surveys by the Coast and Geodetic Survey; (March 1961) $1.50.

236—Narragansett Bay, including Newport Harbor, R. I. Numerous shoreline revisions from modern surveys by the Coast and Geodetic Survey and 1959–60 aerial photography; at scale of 1:20,000 (June 1961) $1.00.

245—Harbors of Plymouth, Kingston, and Duxbury, Mass. Chart completely reconstructed and modernized from modern basic surveys by the Coast and Geodetic Survey; at scale of 1:20,000 (July 1961) 75 cents.

541—New York Harbor—Upper Bay and Narrows, N. Y. and N. J. Includes extensive hydrographic revisions vicinity Buttermilk Channel, New Jersey Pierhead Channel, and Bayonne Terminal approaches from surveys by the Corps of Engineers; at scale of 1:10,000 (July 1961) $1.00.

569—Approaches to St. Johns River, scale 1:40,000. St. Johns River Entrance, Fla., scale 1:10,000. Includes extensive revisions of hydrography and topography from surveys by the Coast and Geodetic Survey and Department of Navy; (August 1961) 75 cents.

1112—Cape Canaveral to Key West, East Coast. Loran rate 2H7 changed to 2H1 and loran lines of position for rate 2L3 have been added to this edition; at scale of 1:466,940 (July 1961) $1.00.

1222—Chesapeake Bay Entrance, Va. Several Pro-

hibited and Restricted areas established along the construction route of the new Chesapeake Bay Bridge; at scale of 1:80,000 (July 1961) $1.00.

1255—Estero Bay to Lemon Bay, including Charlotte Harbor, Fla. Included in this edition are insets of Myakka River, scale 1:80,000, and Peace River, scale 1:40,000, compiled from recent surveys by the Coast and Geodetic Survey to provide chart coverage for these previously unsurveyed and uncharted waterways. Hydrography revised in Pine Island Sound, Gasparilla Sound, and Charlotte Harbor Entrance from surveys by the Corps of Engineers and Coast and Geodetic Survey: at scale of 1:80,000 (August 1961) $1.00.

1265—Pensacola Bay and Approaches, Ala. and Fla. Aids to navigation were completely modernized; scale 1:80,000 (June 1961) $1.00.

5535—San Francisco Bay—Candlestick Point to Angel Island, Cal. Includes extensive hydrographic revisions from recent surveys by the Corps of Engineers and U. S. Navy. In addition, topographic revisions were made from 1959–1960 aerial photography; scale 1:20,000 (June 1961) $1.00.

5576—Suisun Bay—Mallard Island to Antioch, Cal. Numerous shoreline revisions from 1959 aerial photography; scale 1:10,000 (July 1961) $1.00.

5603—Bodega and Tomales Bay, Cal. Hydrography and topography completely revised in Tomales Bay from basic surveys by the Coast and Geodetic Survey; scale 1:30,000 (August 1961) $1.00.

6155—Port of Portland, including Vancouver, scale 1:20,000; Multnomah Channel, southern part, scale 1:10,000. Includes a major revision of hydrography from recent Corps of Engineers surveys and numerous shoreline revisions from 1959 aerial photography; (August 1961) 75 cents.

6195—Grays Harbor, Wash. Hydrography vicinity of harbor entrance completely revised from surveys by the Corps of Engineers and the Coast and Geodetic Survey. Edition includes numerous topographic revisions throughout the chart from Geological Survey quadrangles; scale 1:40,000 (July 1961) 75 cents.

6379—San Juan Channel—Friday and Roche Harbors, Wash. Includes extensive hydrographic revisions from modern surveys by the Coast and Geodetic Survey; at scale of 1:20,000 (July 1961) 75 cents.

6380—Strait of Juan de Fuca to Strait of Georgia, Wash., and B. C. Includes extensive hydrographic revisions from basic surveys by the Coast and Geodeti Survey; at scale of 1:80,000 (July 1961) $1.00.

8201—Etolin Island to Midway Islands, including Summer Strait, Alaska. Inset of Kake enlarged and extended to include the fuel pier located about one mile southeast of Kake. Hydrography in southwest portion of chart, vicinity of Koscivsko Island, completely revised from surveys by the Coast and Geodetic Surveys; at scale of 1:217.828 (July 1961) $1.00.

8557—Knik Arm—Fire Island to Goose Creek, scale 1:40,000; Anchorage, Alaska, scale 1:10,000. Hydrography completely revised from Fire Island to Anchorage from modern surveys and advance information from 1960 survey by the Coast and Geodetic Survey; (July 1961) 75 cents.

9102—Aleutian Islands—Amukta Island to Attu Island, Alaska. Former loran rate 1L7 replaced by new rate 1L2, lines of position replotted due to change in station location. Former loran rate 1L6 changed to 1L3; scale of 1:1,126,303 (July 1961) $1.00.

9141—Kuluk Bay and approaches, Andreanof Islands, Alaska. Includes a major revision of shoreline and hydrography from modern surveys by the Coast and Geodetic Survey; scale 1:30,000 (June 1961) $1.00.

9302—Bering Sea—eastern part, Alaska. Loran rate 1L7 replaced by new rate 1L2, lines of position replotted due to change in station location. Former rates 1L6 and 1L3 changed to new rates 1L3 and 1L7 respectively; scale 1:1,534,076 (July 1961) 75 cents.

Aeronautical

Sectional charts at a scale of 1:500,000—25 cents.

Aberdeen	(Aug. 1961)	Fargo	(July 1961)
Albany	(July 1961)	Green Bay	(June 1961)
Aroostook	(July 1961)	Huntington	(Aug. 1961)
Bellingham	(June 1961)	Jacksonville	(Aug. 1961)
Boston	(July 1961)	Kansas City	(Aug. 1961)
Burlington	(July 1961)	Lake Superior	(July 1961)
Casper	(July 1961)	Lewiston	(July 1961)
Cheyenne	(July 1961)	Lincoln	(July 1961)
Cincinnati	(Aug. 1961)	Milwaukee	(July 1961)
Cleveland	(Aug. 1961)	Minot	(June 1961)
Denver	(July 1961)	Nashville	(Aug. 1961)
Des Moines	(Aug. 1961)	Salina	(July 1961)
Detroit	(June 1961)	Sioux City	(Aug. 1961)
Dubuque	(Aug. 1961)	Wichita	(July 1961)
Duluth	(July 1961)	Winston Salem	(Aug. 1961)

Time Adjustment in WWV and WWVH Standard Broadcasts

On August 1, 1961, at 0000 UT, the National Bureau of Standards advanced the phase of the time signals broadcast from radio stations WWV and WWVH by 50 milliseconds. Such step adjustments are made when necessary to follow the variations in Universal Time (UT-2) so that the time signals remain within about 50 milliseconds of UT-2.

The time signals are maintained on a uniform basis by means of atomic frequency standards. Departure of the time scale from UT-2 reflects a small but perceptible fluctuation in the speed of rotation of the earth.

Similar changes were made simultaneously on the other standard frequency broadcasting stations which have been coordinating their transmissions since early 1960 under an agreement between agencies of the United Kingdom and the United States.

Coordination helps provide a more uniform system of time and frequency transmissions throughout the world, needed in the solution of many scientific and technical problems in such fields as radio communications, geodesy, and the tracking of artificial satellites.

Participating in the project are the Royal Greenwich Observatory, the National Physical Laboratory, and the Post Office Engineering Department in the United Kingdom, and, in the United States, the U. S. Naval Observatory, the Naval Research Laboratory, and the National Bureau of Standards. This program follows previous cooperative efforts of these agencies to achieve uniformity and simplification in procedures.

The transmitting stations which are included in the coordination plan are GBR and MSF at Rugby, England; NBA, Canal Zone; WWV, Beltsville, Maryland; and WWVH, Hawaii.

Comment and Discussion

The pages of SURVEYING AND MAPPING are open to free and temperate discussion of all matters pertaining to the interests of the Congress. It is the purpose of this department to encourage comments on published material or the presentation of news ideas in an informal way.—EDITOR

THE PROFESSIONAL STATUS OF LAND SURVEYORS

JAY SWEET*—I have just finished reading the March 1961 issue of SURVEYING AND MAPPING and would like to comment on the article therein, written by yourself.

First, let me say that I consider your article, under the topic of "The Professional Status of Land Surveyors," the most complete and intelligently written paper on the subject that I have had the privilege of reading. My only comment on this article is in regard to a paragraph stating;

"Money, in itself, does not enter into the definition of a profession, but it does have a profound influence on what others think of a profession. Members of a group that show by their outward appearances that they are not successful in handling their own financial affairs, can hardly instill confidence in the public. A person who uses antiquated equipment and the back room of his house as an office is not likely to contribute to professional standing. Success breeds success. Outward appearances do count. They are part of the overall picture."

What was stated in that paragraph and the manner in which it was stated make it unquestionably true. However, all too many people are ignoring that last sentence. Confidence men and the corporation born of questionable motives (which you so bitterly attack in another article) are quick to recognize these truths and exploit them with deleterious effects on the profession.

The article referred to in the foregoing parenthesis was a reply to a letter from, R. D. Comstock of Florida, regarding liability insurance. In it you state your feelings and reasons for such, regarding the corporate entity in land surveying. As president and director of a practicing land surveying corporation I feel compelled to come to the defense of the corporate professionals.

Your reasoning that, a non-register can hide behind the skirts of a corporation and effectively have a surveying practice, is not a justifiable argument in that there are more opportunities for a non-register to practice under the aegis of an unethical or indifferent license holder than can be found in the loopholes of corporate law. I know of no case where a non-register can practice under a corporation charter that the same condition couldn't be hypothetically manifested in a partnership. On the contrary, in many cases a corporate charter imposes restrictions not affecting partnership or sole proprietorships. Admittedly my experience and association in corporation matters on a national scale are exceedingly limited, and, as a result, my opinions are based strictly on local observation, and I am ever eager to hear more about these problems both pro and con. You imply that incorporation might be acceptable if 100 per cent of its stockholders are registered men. This is an unreasonable and in most cases a crippling condition that defeats the purposes of incorporating. I assume that you mean by 100 per cent of its stockholders, you also mean its executives and directors, otherwise what you imply would be meaningless. One of the benefits of a corporation is to bring a diversity of talent into the organization, i.e., engineers, financiers, accountants, attorneys and promoters, etc., in such proportions as to effect a useful and efficient complex.

Sometime ago, an Eastern University conducted a study on various levels of success of different professions and the results seem to prove what has been obvious to many of us. That is, engineers as a group, are a dismal flop as businessmen. This casts no reflection on the intelligence and the ability of the engineer but rather indicates the limitations of their personalities and emotional makeup. We realize of course, the ideal professional is a well rounded personality that can do anything, but let us be

* Goetech—Land Surveyors, 3695 American Drive (Granger), Salt Lake City 4, Utah. (An open letter to Curtis M. Brown.)

realistic. Professional men are just like anybody else and nobody is perfect. Therefore, a corporation has a chance to more closely attain the perfection that is being demanded by a society of ever increasing complexity.

In further defense, let me quote from a paper written by William H. Baker Jr., excerpts of which are published under the topic of "Identification of Title" in the A.C.S.M. Journal mentioned at the opening of this letter. In discussing the relationship between the surveyor and the title insurance company, Mr. Baker ably states, "One of the principal reasons for the growth of title insurance is that the modern investor in mortgages no longer is the local banker who knows the borrower and his father before him, the property and its past history, and the local examiner. The national investor is remote from the scene; deals with cold hard cash; and now wants the idemnity of a financially sound insurance company behind the title. By like token the national investor no longer knows the local surveyor and is unwilling to accept a plat supported only by a local recommendation as to the ability of the surveyor. The investor is insisting upon that survey being supported by the idemnification of a financially sound corporation."

Here of course it is understood that the corporation referred to is that of the title insurance company. However, this puts the title insurance company in the position of standing good for the surveyor's blunders and, therefore, it appears obvious that the insurance company would prefer to put their trust in a financially sound organization, which condition cannot always be satisfied by the individual land surveyor as easily as by a corporation.

Finally, let me quote a paragraph from a letter to Engineering News-Record, by E. E. Lyford, Executive Director, Committee on Engineering Laws, New York, N. Y. "For over fifty years, industry has demanded and received their engineering professional services through a corporate form, which industry desires because of its many advantages and the additional protection which industry receives from contracts made with a corporation. Because of this many fine reputable engineering corporations have been established—some of them publicly owned and thus unable to change their status and comply with the selfishly drawn proposals of individual engineers who are trying to drive out competition."

I trust the foregoing remarks will be accepted in the spirit of constructive professionalism.

STARTING POINT

Boyd F. Allen*—A Searcher for the Inter-County Title Guaranty & Mortgage Company came across a deed recorded in the Greene County Clerk's Office at Catskill, New York, which has a very unusual starting point, as follows:

"Beginning at a Chestnut stump near to other chestnut stumps which stumps are Southwest of the first stump above referred to and said stump above referred to is the same stump referred to in the deed of O'Connell to the Cairo Water Co. and which stump is at the southwest corner of the following described lot and running thence"—etc.

Editor's note.—This reminds us of an old one—"A skunk sat on a stump. The stump thunk that the skunk stunk, and the skunk thunk that the stump stunk."

* Licensed Land Surveyor, Tannersville, N.Y.

SUBDIVISION CALCULATION BY ELECTRONIC COMPUTATION

Harold J. Welch*—Congratulations to Mr. Howard Jacoby for his presentation of a truly complex subject. His paper reveals evidence of much hard work. He has certainly stated the basic problems which we face in subdivision computations.

It is with reluctance that I must make the following remarks concerning such an interesting article, but Mr. Jacoby has revealed a philosophy for solving our problems which must not stand unchallenged. He writes:

"This, then, is the generalized procedure for solving a traverse (either-open end or closed). *Areas are usually obtained by the DMD method.* With computer programs storing lengths and bearings, areas are generally calculated automatically, since closed traverses have to be solved. Programs storing coordinates need to solve unknowns between starting and ending coordinates so the obtaining of area is optional.

* Assistant Professor of Geodetic Engineering, Department of Civil Engineering, The University of Michigan, Ann Arbor, Michigan; Registered Land Surveyor, Colorado 975, Florida 1306; and Professional Engineer, Colorado 975, New Brunswick 697.

When area is required obviously a closed traverse must be solved." (Emphasis added.)

Please permit me to quote from "Technical Standards for Property Surveys," officially adopted by the American Congress on Surveying and Mapping, SURVEYING AND MAPPING, July–September, 1946.

"III. COORDINATE SURVEYS AND BASE TRIANGULATION SYSTEMS

"The use of the coordinate survey systems of the U. S. Coast and Geodetic Survey and the U. S. Geological Survey is to be encouraged in all states.

"The establishment of secondary triangulation systems tied in and properly related to such coordinate systems is also recommended.

"Wherever available, within reasonable distances, every land survey is to be connected with two or more monuments of the main or secondary triangulation system; and the maps of such survey shall show the correct verified coordinates of such monuments and of at least two of the monumented corners of such survey."

It seems completely incongruous that a paper which treats the most modern of tools should at the same time by implication recommend computations by the obsolete, traverse-closure method as opposed to controlled coordinate computations. The establishment of a coordinate system, even if arbitrarily chosen for the job at hand, means that any point which has been assigned coordinates is instantly, intimately related to every other point in the system, not merely by means of a circuitous traverse such as Mr. Jacoby is often required to follow. Once you have solved a course and have established the relationship between the two end points, it seems to me unthinkable that the same course must be computed again and again every time it happens to fall in the path of a necessary traverse closure.

For what purpose does Mr. Jacoby "generally calculate automatically" the area of every closed traverse, which may often be simply a tool to an end, not a figure at all in terms of the required final plat? The antiquated DMD method was doomed to a slow death over a half century ago, only to be resurrected now in an article whose title implies the very latest in techniques. Professor J. B. Johnson, in his text "Theory and Practice of Surveying," explained area solution by "Criss Cross Coordinate Multiplication" in 1890. Using this method it is OBVIOUSLY *not* necessary to again solve a known closed traverse simply to calculate its area. Once the lot corners are known, its area is readily available if desired.

Mr. Jacoby might profit, as many of us have, by carefully browsing through the excellent literature of ACSM and other organizations. In doing so, he may notice that Dr. W. J. Eckert presented a paper in June 1950, "Electronic Calculators and Their Application to Surveying and Mapping" which implicitly assumed the use of a grid without bothering to discuss it. Let us please have more papers on this subject, but let us go forward in our philosophy, not 70 years or more to the rear!

A CORRECTION

WALDO G. SMITH*—Reference is made to the last paragraph of Colorado Section news, under the heading "Congress News," page 402 of the September 1961 issue of SURVEYING AND MAPPING.

We call your attention to an error of the following nature. The increase of 250 percent should read *150 percent*. We take full responsibility for this error inasmuch as our arithmetic was a little bit shaky at the time.

* Secretary-Treasurer, Colorado Section, ACSM.

ACIC Technical Report on Scribing Rewritten

The Aeronautical Chart and Information Center has completed a rewrite of its Technical Report No. 3, on the subject of scribing as employed in chart production. Originally published in 1952 as "Etching or Engraving on Vinylite," and revised in 1955 with title changed to "Engraving on Coated Vinylite," it has now been brought completely up to date and retitled "Scribing on Coated Plastics." The new text is an adaptation of ACIC's portion of Part II, "Scribing Applications in the U. S. Government Agencies—Aeronautical Chart and Information Center," issued by ACIC in October 1960 as a contribution to the "Report on Scribing" of the Inter-Agency Committee on Negative Scribing.

ACIC Technical Reports are for sale to the public by the Office of Technical Services, Technology Division, U. S. Department of Commerce, Washington 25, D. C.

News of Related Organizations

Georgia Association of Registered Land Surveyors

We are in receipt of a copy of the September 1961 issue of *Field Notes,* the official journal of the Georgia Association Registered Land Surveyors. *Field Notes* used to be a very modest mimeographed publication, but it has now stepped out as a 16-page, 6×9, slick paper publication of which the GARLS may well be proud. The publication now carries advertising, and information as to space available may be obtained from R. H. Davis, Jr., 326 East Paces Ferry Road, N.E., Atlanta 5, Georgia. The editor of *Field Notes* is C. T. Holladay, 1607 Fearn Circle, N.E., Atlanta 19, Georgia.

From a brief study of this issue (Vol. 1, No. 1) it appears that the make-up of future issues will include the following repetitive items or departments: "GARLS President's Letter," "Lawyers' Notes" (Courtesy of Real Estate Section of The Atlanta Bar Association), "Minutes of Meetings," special articles, news items, profiles, etc.

Congratulations to the GARLS.

—EDITOR

Illinois Registered Land Surveyors Association

The Illinois Registered Land Surveyors Association has produced and is distributing its "Directory of Illinois Land Surveyors for 1961." This 5½×8½, 44-page, paper covered publication seems to be somewhat out of the ordinary in some respects, and for this reason we have decided to quote the preface of the booklet as the best means of bringing out its unusual characteristics. This preface follows:

—EDITOR

The purpose of this directory is to provide the general public and those seeking surveying services a guide to the practicing property surveyors in Illinois.

There are more than 900 persons registered as land surveyors in this state and a list of these names is available free on request from the Department of Registration and Education, Springfield. However, many of these are not active nor available for property surveys. The names included in this directory were compiled from a questionnaire sponsored by the Illinois Registered Land Surveyors Association. It is entirely possible than some men, qualified to practice, have not wished their names listed, though it is felt that this list is quite representative.

Any act of land surveying in Illinois must be performed by an Illinois Registered Land Surveyor. All men listed in this directory are currently registered. If a surveyor not listed herein is engaged for any type of land survey, he MUST be registered as a LAND SURVEYOR in Illinois and current for the present year. Anyone offering to practice who is not so qualified should be reported to the Department of Registration and Education in Springfield or to the State's Attorney.

The Illinois Registered Land Surveyors Association neither endorses or recommends the names listed nor implies disapproval for those not listed. This directory is intended primarily as a public service. Not all of those listed, by any means, are members of the Illinois Registered Land Surveyors Association, nor are all the members of the association listed in this directory. A current list of IRLSA membership will be found on page 40.

In the alphabetical listing will be found the surveyor's name, address, phone, Illinois Registration number, the name of the firm he represents (when appropriate), the societies to which he belongs, the types of survey services he provides, and the area in which he is active.

The geographical list was compiled from the questionnaires completed by the individual surveyors. No form of exclusion is intended or implied and any man may be fully competent to survey in any area.

Corrections, additions, and comments will be welcomed by the secretary of IRLSA for improving the 1962 Directory. We hope you find this directory useful.

The Illinois Registered Land Surveyors Association has announced plans for their 1962 Conference to be held on February 12–14. As in the past, it will be in Champaign-Urbana on the University of Illinois campus. The affair is conducted with the assistance of the department of Civil Engineering.

With a triple theme, "Control Techniques," "Legislative Activities," and "Business Operations," the three days will be filled with a

stimulating program. Monday will begin with a paper describing the control necessary to attain a certain level of quality in survey traverses. This will be followed by discussions of celestial observations and of effectual monumentation.

The annual business meeting of the Illinois Registered Land Surveyors Association with the election of officers will be held on Monday evening.

The surveyors liaison with the State legislature will be the feature topic on Tuesday. The remainder of the day will be devoted to a panel discussion, workshops, and resolutions regarding the much-needed plat legislation. The panel will have members from the Bar, Title, and Recorders Associations.

Everyone looks forward to the annual banquet which will be at the Urbana-Lincoln Motor Inn at seven on Tuesday evening. A good time will be had in the fellowship, old fashioned sing-song, and listening to the inspiring message of the banquet speaker.

The program Wednesday includes papers on map indexing and filing; tax records; accounting, invoicing, and collecting for surveyors; and other business problems.

The attendance this year is expected to be much greater than before as the membership of the Illinois Registered Land Surveyors Association has almost tripled in the past year.

Again this year, exhibitors from the many instrument companies and other industries connected with surveying will be on hand to display the latest in equipment, supplies, and services.

The ladies will have a fine social program planned for them by the ladies of the East Central Chapter. In previous years there have been 15 to 20 wives accompanying their husbands, but this year it may be more like thirty.

An announcement and the program both will be mailed out prior to conference, but those who wish specific information should contact the General Program Chairman, Charles S. Danner, 2404 East University Avenue, Urbana, Illinois.

Texas Surveyors Association

The Annual meeting and Short Course of the Texas Surveyors Association was scheduled for October 23–26, 1961, at the Stephen F. Austin Hotel in Austin, Texas, with the first day being devoted entirely to the annual meeting.

Central New York Society of Land Surveyors

Peter P. Gursky sends in the above photograph of CNYSLS members (*left to right*) Ros Cull, Dave Grossman, Bill Rowell, Gus Christopherson, and Ovid White, "happily discussing the Third New York State-wide meeting of the Land Surveyors, to be held in Syracuse in February 1962," at the 1961 clambake at Hinerwadels Grove, North Syracuse, N. Y.

The October meeting of the Central New York Society of Land Surveyors was held in the Yates Hotel, Syracuse, N. Y., and opened by President Tarbell at 8:30 p.m.

President Tarbell read letters from S. T. Snyder, Vice President of the N.Y.S. Association of Consulting Engineers; R. W. Sweet, Chief Engineer, N.Y.S. Dept. of Public Works; and Ignose Bosinski, President of the Niagara Frontier Land Surveyors Association, the latter in regard to the forming of an upstate N. Y. Section of A.C.S.M. It was decided that a meeting between representative groups of the two organizations should be held to further discuss this matter.

The members present were in favor of having our society sponsor the third statewide meeting of Land Surveyors—February 16 and 17, 1962—at the Yates Hotel. The General Chairman will be President Tarbell; Exhibits Chairman, Pete Gursky; and Program Chairman, Joel Phillips, with other chairmen to be appointed later.

—David Grossman
Secretary-Treasurer

Wisconsin Society of Land Surveyors

The University of Wisconsin Extension Division, in cooperation with the College of

Engineering and the Wisconsin Society of Land Surveyors, scheduled their 13th Annual Surveyors Institute for December 6–8, 1961, on the Madison Campus of The University of Wisconsin. This annual Institute provides surveyors an opportunity to review and keep abreast of practical problems that confront them in their practice of Land Surveying.

Some of the topics and guest lecturers for this session include:

"Professional Status for Surveyors," Ralph M. Berry, Professor of Geodetic Engineering, The University of Michigan, Ann Arbor, Michigan;

"Care and Adjustment of Surveying Instruments," Dan H. Harkness, W. & L. E. Gurley, Troy, New York;

"The State Coordinate System," Lansing G. Simmons, Chief Mathematician, Geodesy Division, U. S. Coast and Geodetic Survey, Washington, D. C.;

"Business Practices for Land Surveyors," Joseph C. Schabacker, Associate Professor of Commerce, The University of Wisconsin, Madison, Wisconsin; and

"Solar Observations," Leonard F. Hillis, Professor of Civil Engineering, The University of Wisconsin, Milwaukee, Wisconsin.

The committee responsible for the program and all arrangements was made up of the following:

Eldon C. Wagner, Professor of Civil Engineering, The University of Wisconsin; Leonard F. Hillis, Professor of Civil Engineering, The University of Wisconsin-Milwaukee; Foster Curtiss, President, Wisconsin Society of Land Surveyors, Plymouth Wisconsin; and Edward O. Busby, The University of Wisconsin Extension Division, Madison, Wisconsin.

New Seismological Laboratory

Construction of the Nation's newest and most modern seismological laboratory has been completed by the Coast and Geodetic Survey on land owned by the Isleta Indians near Albuquerque, New Mexico. The laboratory will serve as the principal research and development center for earthquake studies and instrumentation in the Survey and provide a vital link in the vast program of locating earthquakes throughout the world. The laboratory will play an important role in the development of seismic instrumentation, particularly strong motion equipment which is extremely important in engineering seismology and, in turn, gives data from which codes for the safe construction of buildings in earthquake areas are formulated. Experimental work to be done at the New Mexico site could prove to be very valuable in the perfection of a system for detecting artificial explosions.

Much of the Nation was combed in the search for an area where a minimum of background noise was present. The Isleta Indian land contains a massive outcrop of solid granite that is exceptionally favorable to seismic studies. The instruments at the facility will be capable of magnifying earth motion a half million times or more.

Leasing Indian land requires a number of official clearances which include concurrence by the Indian leaders themselves. U. S. Senator Dennis Chavez of New Mexico rendered valuable assistance in negotiating with Isleta Pueblo Governor Esquipula Jojola and his predecessor John Zuni, and with the Bureau of Indian Affairs in obtaining the 673-acre tract for the laboratory.

The facility, which will cost approximately $340,000 when fully equipped, is made up of seven buildings and two specially constructed vaults. The three principal buildings contain the instrumental research laboratory, the office, and the instrument shop—all fully air conditioned. The two vaults are about one-quarter mile distant from the buildings and located inside the granite mountain at the end of 40-foot tunnels. Within these vaults some of the most sensitive seismographic equipment in the world will operate. The entire construction program was carried out under the technical direction of the Bureau of Indian Affairs at Albuquerque, New Mexico.

A highly trained staff of seismologists and instrument makers will man the laboratory under the direction of Herman J. Wirz, Jr., of Tulsa, Oklahoma. Personnel will commute from Albuquerque to the laboratory, a distance of approximately 15 miles.

Congress News

Election of Officers for 1962-63 Period*

ACSM President, Brother B. Austin Barry, appointed the following Nominating Committee: Roland H. Moore, W. B. Williams, and George C. Bestor, *Chairman*. This committee deliberated in sessions at Phoenix, Arizona, during the ACSM Western Regional Conference, and, following established precedent and the provisions of the ACSM Constitution, in the best interest of balance and composition of our Board of Direction, proposes this single slate of candidates for the offices about to be vacated by expiring terms

For President
Walter S. Dix
For Vice President
James L. Bell
For Directors
Jon S. Beazley
Curtis M. Brown
Kenneth S. Curtis
Tom Dillon
Earle J. Fennell

October 21, 1961—for the committee
GEORGE C. BESTOR, *Chairman*

All have been contacted and have indicated acceptance of responsibility and willingness to serve.

* Annual Meeting through Annual Meeting.

COMPOSITION OF PROPOSED ACSM BOARD OF DIRECTION 1962–1963

	Origin	Present Location	Agency	ACSM Division
Dix	(UK/US) Ohio	D. C.	TVA	All
Bell	Fla.	Kans.	P. P.*	P. S.
Barry	N. Y.	N. Y.	College	Educ.
Karo	Nebr.	D. C.	USC&GS	Control
Bill	N. H.	Mass.	P. P.*	PS-Ed.
Clemens	Mich.	Mo.	ACIC	Cart.
Emminizer	Md.	D. C.	USC&GS	Cart.
Thorpe	Ga.	Va.	Com'l.	Instr.
Beazley	Ga.	Fla.	P. P.*	—
Brown	Me.	Calif.	P. P.*	P. S.
Curtis	Ind.	Ind.	College	Educ.
Dillon	Ark.	Tex.	Industry	P. S.
Fennell	N. D.	D. C.	USGS	Topog.

Plus Treasurer Hemple and Editor Rappleye.

* Indicates private practice.

Brief biographies of the candidates follow.

WALTER S. DIX

Walter S. Dix, born in England just before the turn of the century, received early education in technical drafting and machine design at British and American public schools, which was followed later by training in engineering through correspondence and university extension courses. Practical experience was gained in the automotive industry, the glass and ceramic industry, and in river and harbor operations. In addition to his engineering and surveying experience, he has a rich background in the graphic arts, having specialized in photo-mechanical-chemical process and equipment development for cartographic production and reproduction.

From 1924 to 1932 he was a member of R. H. Randall & Co., Inc., geodetic and topographic engineers with city survey activities in some 22 cities, and the Randall Press, Inc., a precision map engraving and publishing plant. Before joining the Tennessee Valley Authority in 1935, he was Engineer of Field Surveys for the U. S. Civil Works Administration and Federal Emergency Relief Administration in Lucas County, Ohio, and for the City of Toledo.

A civil engineer with the TVA, Mr. Dix is the Washington representative and liaison officer for the TVA's Maps and Surveys Branch.

A member of the American Society of Photogrammetry, the American Geophysical Union, and a Fellow of the American Society of Civil Engineers, he is registered professionally as an engineer in Ohio and the District of Columbia, and also professionally as a surveyor in Ohio.

He assembled the "Report on USA Surveying" for the ACSM for the New Zealand Conference in 1950. In 1952 he was selected by United Nations to write the "Report on Map Reproduction in USA" which was published in *World Cartography*. He is chairman of the Inter-agency Committee on Negative Scribing of the Federal mapping agencies, and a member of several technical committees on standards and symbolization in these related fields. He is ACSM member to the Committee on Cartography, Advisory to the Department of State, of the National Academy of Sciences–National Research Council.

He is a charter member of the American Congress on Surveying and Mapping and has served actively on the Publications, Membership, Annual Meeting, and Constitution Committees. In 1950, he received Honorary Citation from the Congress for "outstanding professional services rendered without remuneration to ACSM to advance aims and purposes of the profession and the public welfare." He has served as Executive Secretary of the ACSM since 1946, and last year served as both Executive Secretary and Vice President.

JAMES L. BELL

James L. Bell was born in Noma, Florida, October 2, 1917. On graduating from high school he followed various vocational pursuits, continuing his education in parallel with miscellaneous uncredited studies. From 1940 through 1945 he was with the U. S. Corps of Engineers as an engineering aide and was responsible for surveying and survey calculations. From 1945 to the present, as owner of the firm of James L. Bell & Associates, with principal office in Overland Park, Kansas, and a branch in Denver, Colorado, Mr. Bell has been seriously occupied with professional surveying and related operations. He is licensed as a surveyor in Missouri, Colorado, New Mexico, Utah, and Wyoming; and is licensed as an engineer in Kansas. He is a Past President of the Kansas Society of Land Surveyors. An active member of the Property Surveys Division, he is a member of a FIG Commission and will represent the ACSM on FIG Commission VI in Vienna at the FIG meeting in 1962. He was Chairman, Fees and Salaries Committee, PSD, ACSM, from 1956 to 1959 and was the author of the published report of the Fees and Salaries Committee in 1959. He is a Past Chairman of the Property Surveys Division and is currently a Director of the ACSM, serving on the Board of Direction's Professional Status Committee.

JON S. BEAZLEY

John S. Beazley, Tallahassee, Florida, is a native of Social Circle, Georgia, and has been actively engaged in surveying and mapping since 1937. After beginning as a rear rodman for the Georgia State Highway Department, he has worked for the Resettlement Administration; General Land Office; AAA Service, U. S. Department of Agriculture; the U. S. Corps of Engineers; and for the last seven years has been head of the Photogrammetric Division, Florida Road Department.

Mr. Beazley attended North Georgia College, but stopped during the great national depression. He then went on to complete his education in civil engineering via the I.C.S. He served during World War II in the CBI as a Warrant Officer, Topo Specialist. He has served on the Advisory Council of the ACSM since 1953; four terms as Chairman, Surveying and Mapping Section, Florida Engineering Society; two terms on the Executive Committee, Surveying and Mapping Division, American Society of Civil Engineers; is a Past President of an area chapter of the Florida Engineering Society, and is currently Chairman of the Committee on Highways, American Society of Photogrammetry.

He has written a number of papers on photogrammetry and cadastral and geodetic surveying. He invented and holds a patent on the Photo-Cartographer, a simple (low-order) projection stereoplotter. He is a registered engineer in Florida and for the past several years has offered private consulting services to the Southeast and Caribbean area.

CURTIS M. BROWN

Curtis M. Brown was born in Maine on December 16, 1908, but has lived in San Diego, California, since June 1909. His father was a surveyor for the San Diego & Arizona Eastern Railway and for a utility company. A licensed land surveyor in California, he has been active in the American Congress on Surveying and Mapping, having served the Property Surveys Division as chairman of the Legislative Committee and as both Second Vice Chairman and First Vice Chairman of the Division.

Perhaps he is best known to most of the members of the ACSM because of his writing. He is the author of two books, *Boundary Control and Legal Principles* and *Boundary Control for Surveyors in California*, and he has written several articles for SURVEYING AND MAPPING, as well as having been a steady contributor to its department, "The Surveyor and the Law."

For several years, Mr. Brown was a part-time college instructor for various subjects, mainly the legal elements of property-line determination. As a partner in the firm of Daniels, Brown and Hall, he has been in private practice for 16 years. Writing and teaching have been in the nature of hobbies; his primary interest is in property surveying. He has appeared as a speaker at many of the annual surveyor's conventions: Utah, Wisconsin, Illi-

nois, Michigan, Arizona, California, and Minnesota.

Mr. Brown attended San Diego State College for lower division work and graduated from the University of California in engineering in 1932. For his work on a thesis, "The Gas Lift," and for a high scholastic grade average, he was awarded honors at graduation. He lettered in track.

His two children are both attending the University of Arizona, one taking civil engineering. His wife is a well-known dog fancier and judge. He is president of a kennel club and a Past President of the San Diego Council of Civil Engineers and Land Surveyors.

KENNETH S. CURTIS

Kenneth S. Curtis was born and raised in Indiana and received his education in civil engineering from Purdue University, receiving both the B.S. (1946) and M.S. degrees. He has always considered his specialization as surveying and mapping, has taught these subjects at Purdue during the past fifteen years, and has attained the rank of Associate Professor. He has taught courses in engineering, cartographic, geodetic, and photogrammetric surveying, both on campus and at summer surveying camp. He has authored several articles on these topics, including the compilation of films.

It is his firm belief that teachers should have varied experience to teach these subjects. As a result, his experience has included a season's work aboard the U.S.C. & G.S. Ship *Explorer* in Alaskan waters; work with Jack Ammann Photogrammetric Engineers of San Antonio, Texas; work with geodetic triangulation and leveling parties of the U.S.C. & G.S. in Indiana and New York; work in data reduction with the R.C.A. Missile Test Project at Cape Canaveral, Florida; and many surveying and mapping projects of lesser magnitude.

Mr. Curtis is an active member of the American Society of Civil Engineers (currently serving as editor of *News of the Surveying and Mapping Division of ASCE*), American Congress on Surveying and Mapping (currently serving as a director of the Control Surveys Division and formerly, in 1956–57, as a Director of the ACSM), American Society of Photogrammetry (currently serving as Chairman of the Education Committee), American Society for Engineering Education (in 1960, Chairman of the Surveying and Mapping Committee), American Geophysical Union, and the Society of American Military Engineers. For several years he has been Executive Secretary of the Indiana Society of Professional Land Surveyors and has had responsibility for organizing the annual meetings and editing the proceedings.

He is currently on a year's sabbatical leave and is studying geodetic science at The Ohio State University.

TOM DILLON

Tom Dillon was born in Arkansas, raised in Mississippi, and attended Louisiana State University for a time. However, for economic reasons he dropped out of school and was working at various construction and subprofessional engineering jobs when drafted for the armed forces.

During his period of military service he attended the University of Michigan and Mississippi State College, taking courses in civil engineering. After this he served with the Combat Engineers, both in the United States and on Okinawa.

Upon discharge from the armed forces, he reentered Louisiana State University and secured a B.S. in Civil Engineering. Upon graduation he was affiliated with the Union Oil & Gas Corporation, Houston, Texas, as a draftsman. He progressed through succeeding steps as Construction Engineer, Design Engineer, and Land Surveyor and is now Assistant Chief Civil Engineer in charge of land surveying, design, and construction, as well as a Departmental Office Manager.

Mr. Dillon is registered in Louisiana as a Professional Engineer and Land Surveyor and in Texas as a Professional Engineer and Public Surveyor. He has served the Texas Section, ACSM, in various capacities and ultimately served as Chairman. He is presently serving as Property Surveys Division Advisor for the Texas Section. As a member of the Texas Surveyors Association, he has held various officer positions and has just completed a term as president of the organization.

EARLE J. FENNELL

Earle J. Fennell, a native of North Dakota, graduated from the University of North Dakota in 1933, with a B.S. in Civil Engineering. Prior to and at periods during his college years, Mr. Fennell was employed by the U. S. Geological Survey as an engineering aid. After graduation, he worked for the North Dakota State Highway Department for a short time as party chief in charge of preliminary highway surveys. He then returned to the Geolog-

ical Survey. Until 1947 he was engaged in topographic surveys in the central part of the United States. In January 1947 he was assigned to the headquarters office in Washington, D. C. Since that time he has filled progressively more responsible positions leading to his present position as Associate Chief Topographic Engineer.

Mr. Fennell is a registered Professional Engineer in the State of North Dakota. He is a member of the American Society of Civil Engineers and a Past Chairman of its Surveying and Mapping Division. He was recently appointed a member of the Task Committee on Professional Practice in Surveying and Mapping, of the Committee on Professional Practice of the ASCE. He is a member of the American Congress on Surveying and Mapping and a Past Chairman of its Topography Division. He is also a member of the American Society of Photogrammetry and has served on its Nominations Committee.

Mr. Fennell was a delegate from the Surveying and Mapping Division, ASCE, to the "Conference on Basic Research in Civil Engineering," ASCE, held at George Washington University in 1958. He is the author of several articles on various aspects of surveying and mapping which have been published in various technical journals, including SURVEYING AND MAPPING.

Colorado Section

The Colorado Section, ACSM, met September 12, 1961, in the auditorium in Building 25 of the Denver Federal Center. The meeting was called to order by Chairman Louis S. Soreide at 7:40 p.m. There were 25 members in attendance. In the absence of Secretary-Treasurer Waldo G. Smith, the chairman requested Edwin O. Windham to act as secretary.

After the transaction of some routine business, Chairman Soreide welcomed back those members present after the summer vacation. He expressed his appreciation for the attendance to date at regular meetings and lectures, and asked each one present to urge others to attend the remaining lectures in the series. The ACSM Regional Meeting in Phoenix in October was announced. The meeting was then turned over to the program chairman.

Edwin O. Windham made a brief announcement concerning the lectures for the second half of the year and urged all present to try to get others to attend. He then introduced the speaker, Stanley M. Borell, C.E., of the U. S. Geological Survey, who gave an interesting, informative, and illustrated talk on "Photogrammetric Equipments and Their Uses." Questions, answers, and discussions were interjected with the showing of nearly every slide.

The chairman requested the membership to offer suggestions to J. Turner, chairman of the committee on nominations, for officer candidates for 1962.

—E. O. WINDHAM
Acting Secretary

In lieu of an evening meeting of the Colorado Section, ACSM, on October 31, 1961, arrangements were made to tour the U. S. Geological Survey Photographic Laboratory in Building 25 of the Denver Federal Center during the afternoon of either October 31st or November 1st as best suited the convenience of individual members.

A dinner meeting was planned for November 13, 1961, at the Holland House, Golden, Colorado, the program to include reports from the Western Regional Conference in Phoenix and the introduction of officer candidates for 1962.

NOTE.—The above is based on an announcement of these meetings which was sent out under date of October 24, 1961. —EDITOR

Texas Section

The Texas Section, ACSM, enjoyed a social hour and banquet, held a business meeting which amended its bylaws, and enthusiastically received a technical paper on photogrammetry on September 22, 1961. Forty members and guests enjoyed this evening of fellowship and study at the Lamar Hotel in Houston from 6 to 9:30 p.m.

Membership of the Section is now 196. New members attending their first meeting were J. E. Willingham and William F. Forrest.

The bylaws change provides for the nomination of one candidate for each office of the Section, in lieu of two, by the Nominating Committee, customarily composed of Past Chairmen of the Section.

An excellent and well-received paper on "Photogrammetry" was presented by Pliny Gale, President of Jack Ammann, Inc., of San Antonio, Texas.

Interest in the Western Regional Meeting in Phoenix, Arizona, and the Short Course and Annual Meeting of the Texas Surveyors Association in Austin, Texas, is high in Houston. Both meetings are to be held in October.

Chairman Walston announced that plans are being made for a joint meeting of the Texas Section, ACSM, and the Gulf Coast Chapter, T.S.A., on December 15, 1961. It will be the Annual Meeting of the Section, at which time results of the election of officers of the Section will be announced. In recent years, it has been

the custom to invite the ladies for this meeting. A hundred members and guests are expected to attend.

—Hodge E. Mason
Acting Section Editor

Editor's note.—In the letter transmitting the above, Mr. Mason wrote: "I'm substituting this one time for Forrest Daniell who recently underwent surgery but is now recuperating at home. We expect him to be back in circulation soon."

St. Louis Section

A meeting of the officers, directors, and committee chairman of the St. Louis Section, ACSM, was held on September 18, 1961, at which time plans for Section activities for the coming year were discussed and reports of officers and committees were presented.

Among the items in the minutes of the meeting the following have been selected as of most general interest.

It is proposed to issue the Section's *Newsletter* four times during the year.

The Control Surveys Committee will expand its scope by including geodesy and geophysical fields since there are no professional societies active in these fields in the St. Louis area. This expansion will serve the membership as the focal point for control activities concerning USAF Aerospace Cartography. The possibility of establishing a standing committee on Aerospace Cartography is being explored.

The Chairman recommended that technical committees should compile expository papers on their technical activities to be submitted for publication in Surveying and Mapping.

—Editor

The St. Louis Sections of the American Congress on Surveying and Mapping and the American Society of Photogrammetry will be hosts for the 1962 Regional Meeting of the ACSM and the 1962 Semiannual Meeting of the ASP. This combined event will be held at the Chase-Park Plaza Hotels in St. Louis, Missouri, September 9–14, 1962. Cordial invitation extends to ACSM and ASP members and their friends to discover a new "Spirit of St. Louis" through a most interesting program of technical sessions, exhibits, and social activities.

North Carolina Section

A joint meeting of the North Carolina Section, ACSM, and the PS&M Functional Section, PENC, was held at 7:30 p.m., September 19, 1961, at Holiday Inn, Salisbury, N. C., with 16 members and guests attending. Ben L. Smith, Jr., Chairman, NCS, presided.

R. D. Stout, Chairman, PS&M Functional Section, PENC, arranged the program for the evening and introduced N. Glenn Walker, of Greensboro, N. C., who spoke concerning the precision of surveys. He discussed the "Manual of Land Surveys" with special reference to the role that engineers and land surveyors play in the surveying of property. The question was raised by members present concerning County Exemption from the Uniform Map Law. Much discussion of this question followed. The consensus was that, just because the various counties are exempt from the map law, surveyors should not consider themselves exempt also.

It was voted unanimously by the members present that the next regularly scheduled meeting should be held in two sections: the first with the North Piedmont Chapter of the PENC in Greensboro on November 20th; the second with the Western Carolina Chapter in Asheville, November 21st; to hear Frank Riley of Park Aerial Surveys discuss aerial photography as it applies to our present day matters in the fields of land surveying and engineering. This arrangement will permit members in the central and eastern part of the State to attend the Greensboro meeting and those in the western part of the State to attend the meeting in Asheville.

—Dale J. Mills
Secretary

Kansas City Section

The Executive Board of the Kansas City Section, at a meeting held July 25, 1961, discussed and recommended that the Section dues be raised to $2.00 per annum and that the name of the Section be changed to "Heart of America Section" to be more inclusive, area-wise, for the membership. The Board believed that with annual dues of $2.00 the costs incidental to the operation of the Section can be better met. Postage and stationery just about use up the dues at the $1.00 rate. The dues raise would become effective for new members immediately upon acceptance by vote of the membership.

As invitations to membership will be tendered to interested parties outside the metropolitan area of Kansas City, it is believed that to better identify the area in which the members reside the Section name should be changed.

The constitution requires that these two changes be voted upon and accepted by the members of the Section. A ballot to be used in voting on these two questions was circulated

to the membership of the Section.

Daniel Kennedy, head of the USGS office in Rolla, Missouri, was scheduled to be the guest speaker at the September meeting.

NOTE.—We have not been informed as to the fate of the proposal to raise the dues, but, because the ACSM Board of Direction, meeting in Phoenix, Arizona, during the period of the Western Regional Conference, approved the change of name for the Kansas City Section, the vote on that question in the Section must have been in the affirmative. The new name, officially, is "Heart of America Section, Western Missouri-Eastern Kansas, of the American Congress on Surveying and Mapping," but we reserve the right to call it the "Heart of America Section, ACSM" in the pages of this Journal.

—EDITOR

Southern California Section

A copy of the *A · C · S · MEMO,* bearing the date of October 1961 and emanating from the Southern California Section, ACSM, has arrived. This is apparently a new form of newsletter for the SCS. It contains an announcement of the Western Regional Conference in Phoenix; an announcement that the Membership Committee is working on a roster to be brought out in an attractive format; an announcement of the convention of the Professional Engineers of Oregon, November 10–11, 1961, to which an invitation is extended to ACSM members to attend; an announcement of the December dinner meeting, with further details to be forthcoming; and, on the other side of the sheet, a short article on "Field Notes" which is a plea for great care and neatness in keeping field notes, with some suggestions as to how this can be accomplished.

—EDITOR

Oregon Section

The annual meeting of the Oregon Section, ACSM, was held September 23, 1961, at the Marion County Courthouse in Salem, Oregon, and included an afternoon technical session and an evening dinner and business session.

After the registration, which began at 1:30 p.m., and a pre-conference get acquainted period, the meeting was called to order at 2:00 p.m., by Chairman H. Bruce Schminky.

A motion picture film with sound, entitled "Petroleum Exploration" and furnished by the Shell Oil Company, was shown. It covered the techniques of oil exploration from the earliest days of oil seeps to present day methods using sound reflection. The film was informative, interesting, and was well received by the membership.

Robert Smith of the Union Title Company could not be present because of illness. In his place, Mr. Simpson, a mathematician, now attending Willamette University, gave an explanation and demonstration of a unique solution of the three-point problem that can be readily solved in the field without the use of the calculator, but adapted to slide rule methods. In general his solution may be explained briefly as follows: Prior to going out, he would scale grid coordinates from a map, using such features as road intersections, etc., and exactly solve the three-point problem from at least three triangulation stations that he expected to be visible from the occupied position at or near the scaled point. He then observes the angles between the stations and the differences between the observed angles and those of the exact office solution are very small and can be solved by triangles, using the trigonometric functions, to obtain the short sides of the triangles very exactly. The functions for obtaining the long sides are very nearly 1.00.

Mr. Simpson, after the completion of his talk, answered questions and appeared to be well versed in the sometimes difficult task of obtaining a location by the three-point method.

At 3:00 p.m., the company adjourned to the courthouse lawn for a demonstration of the Electrotape by John Keeley. Mr. Keeley explained that Clackamas County had purchased the instrument, at a cost of approximately $16,000, for use in a resurvey of the county. This county has some of the oldest General Land Office surveys in the west, some dating back to about 1836. Mr. Keeley also demonstrated the use of small radios in surveying, exploring the limitations and general advantages over visual signals between the instrumentman and the rodman or chainman working at a distance.

At 4:00 p.m., J. Wesley Kuarsten, Planning Consultant for the Mid-Willamette Valley Planning Commission, spoke on "General Principles of Planning." He illustrated his talk with blackboard drawings, and reviewed general planning trends, beginning with the block or grid system and illustrated modifications, the lengthened blocks, and finally the possible return to alleys or courts to provide access to the rear of lots. His talk was interesting, emphatic, and, of course, as all planning commission activities do, provoked a great deal of discussion.

Ted Watson of the Oregon State Water Resources Board spoke on "Oregon State Mapping" and presented the Advisory Committee report

prepared for presentation to the State Legislature. He pointed out that it will require 735 sheets to complete the topographic mapping of the State of Oregon, and his committee is recommending that the State provide funds to be matched by U. S. Geological Survey funds to accelerate the mapping program and looking toward its completion in 15 years. The total cost to the State and the Federal Government would be in excess of $10,000,000.

At 5:00 p.m., the meeting adjourned and the Board of Direction held a short session for general discussion. The evening session began at 5:40 p.m., at Monks Supper Club, with a social hour. After the dinner was finished at 7:30 p.m., several informal speeches were made from the floor.

Owen Smith, being the oldest surveyor present, and Scotty Graham, for this faithful endeavors in behalf of the Oregon Section, were voted honorary members. Mr. Smith gave a short talk concerning his experiences as a surveyor in Oregon.

The business session began at 8:00 p.m. Chairman Schminky called on the Tellers Committee, Steve Strylewicz and Kermit Epps. They announced the results of the balloting which elected the following officers:

Chairman—A. D. Graham
Vice Chairman—Glenn Tyler
Secretary-Treasurer—R. Wilson Hutchison
Editor—Chester Stuart
Directors—Bert Mason, Jr. (Northwest Oregon) and Norman Harroun (Eastern Oregon).

Francis E. Waggoner, Secretary–Treasurer, then gave the financial report and a brief resumé of the activities of the past year.

Final adjournment came at 9:15 p.m.

—Francis E. Waggoner
Secretary-Treasurer

PLEASE!

Read and heed (especially the last half) the "Editory Yell"—Surveying and Mapping, June 1961, Vol. XXI, No. 2, page 261. There is lots of room for improvement yet. —Editor

Deaths

William R. Boothe of Greensboro, N. C., a brother of **Zilmon J. Boothe, Jr.,** of San Antonio, Texas, was one of four victims of the crash of a private plane near Roanoke, Virginia, on August 30, 1961. The other victims were Boothe's wife, the former Helen Cunningham; J. H. Cunningham, Jr.; and his wife, the former Margaret Saunders of Rocky Mount, N. C. Cunningham and Boothe were officials of Boothe, Inc., an aerial survey firm. Mr. Boothe lived in San Antonio, Texas, until about 1941 and was employed by Kargl Aerial Survey Co., and Edgar Tobin Aerial Surveys.

Clarence A. Shelton, a geodesist with the U. S. Coast and Geodetic Survey, died at the George Washington University Hospital in Washington, D. C., on August 4, 1961, at the age of 59.

Prior to his death Mr. Shelton had become Chief of the Survey's Horizontal Control Section. This assignment followed almost 25 years of survey work in the field. His field accomplishments included pioneering work in the use of electronic surveying equipment, notably the Geodimeter, and other highly specialized observations in geodetic and astronomic work.

Mr. Shelton was born in Lim Rock, Alabama; attended the Wills-Taylor Preparatory School in Huntsville, Alabama, and the University of Cincinnati; and received his B.S. degree in civil engineering from the University of Alabama in 1931.

He is survived by his wife, Mary Brown Shelton, 3022 Porter Street, N.W., Washington, D. C., and three brothers: Sidney, Detroit, Michigan; Horace, Huntsville, Alabama; and Captain George Shelton, a retired Coast and Geodetic Survey Officer, now living in St. Louis, Missouri.

David C. Boswell, 793 East Drive, Oradell, N. J., died October 7, 1961, at the age of 67.

Formerly with the New Jersey State Highway Department, Mr. Boswell, in 1924, founded the Boswell Engineering Company, Ridgefield Park, N. J., and at the time of his death was Chief Consultant for that company. He was Village Engineer for Ridgefield Park for 35 years. He was responsible for much of the engineering work on the Vermont portion of the Interstate Highway System and was a consultant on the New Jersey Turnpike, the Garden State Parkway, and the New York State Thruway.

In addition to his membership in the ACSM, Mr. Boswell was a member of the Society of American Military Engineers and the Vermont Society of Engineers; a life member of the Englewood Yacht Club; a past president of the Ridgefield Park Rotary Club; a former director of the New Jersey Society of Professional Engineers; a member of the Hackensack Golf Club, and a 32° Mason.

He is survived by his wife, Anna; two sons, Howard L., and David J., who now operate the engineering firm founded by their father; six brothers, one sister, and seven grandchildren.

Personals

Porter W. McDonald, Jr., recently product manager of surveying equipment for the Eugene Dietzgen Company, has been named chairman of the civil engineering technology program of the Ohio College of Applied Science, Cincinnati, Ohio.

William Shofnos, Assistant Chief, Marine Data Division, Coast and Geodetic Survey, has been designated as a Member for the United States of the Pan American Institute of Geography and History.

Donald B. Clement, who started his cadastral engineering career in August 1910, retired from active duty with the Bureau of Land Management, Department of the Interior, on August 19, 1961, the 51st anniversary of the date he commenced work with the former General Land Office. At the time of his retirement, Mr. Clement was Chief, Division of Engineering, Bureau of Land Management.

During these many years he advanced successively through the several phases of the field and office activities of the cadastral work of the Bureau. In recent years he has devoted much time to the solution of problems incident to the administration and development of the resources of the Outer Continental Shelf.

In 1957 he was given the Distinguished Service Award, the highest award of the Department of the Interior.

Mr. Clement has taken an active interest in the work of the American Congress on Surveying and Mapping. He is well known to many through his attendance at the annual meetings, as well as several regional, State, and special meetings of the Congress and the presentation of papers at those meetings. He intends to maintain his home in Washington, D. C., and preserve his professional contacts.

Professor **James H. Lucas** has been in Cambodia during recent months on an inspection tour of a highway built there with U. S. aid under the I. C. A. The highway is failing and Uncle Sam wants to know why. For further information on the subject, see *Engineering News-Record,* June 29, 1961, page 20.

Professor **Kenneth S. Curtis** is on a sabbatical leave from Purdue University for the academic year 1961–62 and is studying geodetic surveying and photogrammetry in the Department of Geodetic Science at the Ohio State Universtiy.

Paul Blake, Chief, Photogrammetry Section, Topographic Division, Rocky Mountain Area, U. S. Geological Survey, has left for a two-year duty in Quetta, West Pakistan, where he will set up a photogrammetric operation for the Pakistanian Government.

Walter D. Lambert, retired Coast and Geodetic Survey mathematician, of Canaan, Connecticut, while on a visit to Washington in late October, was set upon and severely beaten in an attempted robbery.

Director **Nelson C. Clark** of the St. Louis Section, ACSM, is president of the Missouri Council of Geographic Education. Vice Chairman **Robert H. Kingsley** was scheduled to address the 16th Annual Meeting of the American Society of Quality Control, November 19–20, 1961, on a topic dealing with statistical inferences.

Colonel **Lawrence E. Schick,** Professor and Head of the Department of Earth, Space, and Graphic Sciences of the United States Military Academy, retired in the rank of Brigadier General on September 28, 1961, after 42 years service, the last 15 years as Professor at the Academy.

Among several changes in management of Aero Service Corporation, **Virgil Kaufman** becomes chairman of the board, with executive powers, and **Harry Burchett** has been named director of all Aero Service subsidiaries at home and abroad.

Ronald A. Caton who is with the S. E. Radiation Health Facility of the U. S. Public Health Service is leaving in January 1962 for an assignment to Antarctica and will be there for approximately a year.

PLAN TO ATTEND THE 1962 ACSM-ASP COMBINED MEETINGS AND EXHIBITS SHOREHAM HOTEL, WASHINGTON, D.C., MARCH 11–17, 1962.

(*See* pages 547 & 548 for further information.)

NEW MEMBERS

ALINN, Alphonse, J., 1737 Mapleview Dr., Cleveland 31, Ohio—Civil Engineer, Sam W. Emerson Co.

ALLEN, James N., 5568 Cleves-Warsaw Pike, Cincinnati 38, Ohio

ALMQUIST, John R., 5413 31st St., N.W., Washington 15, D. C.—Cartographer, U.S.C. and G. Survey

ALVAREZ, Juan, 226 N. Guilford Dr., San Antonio 17, Texas—Cartographic Technician, San Antonio Field Office, Army Map Service.

ANGEL, James H., 8217 Brookpark Rd., Cleveland 29, Ohio—Surveyor and Engineer, Davis, Angel, Boor Co.

APPLEGATE, James W., R. F. D. 2, Mechanicsburg, Pa.—Field Supervisor, Buchert, Horn, Inc.

ATTEBERRY, T. T., 124 W. First St., Biloxi, Miss. —Owner, Coast Survey and Planning Service

BAKER, William H., Delaware State Highway Dept., 152 S. State St., Dover, Del.—Principal Map Draftsman

BERRYMAN, J. F., 5922 Long Meadow, Houston 33, Texas—Jr. Surveyor, Shell Oil Co.

BARKER, Harold J., Jr., 2801 Revere Blvd., Brigantine, N. J.—State Topographic Engineer

BESSON, Charles L., Jr., 1409 Donahue Ferry Rd., Pineville, La.—Land Surveyor, F. Joseph, Associated Engineers

BEWICK, Robert D., Jr., Delaware State Hwy. Dept., 152 S. State St., Dover, Del.—Planning Engineer

BIGELOW, Paul, 98 S. Main St., Waterbury, Vt.— Land Surveyor

BLANCHAR, John E., 3316 Belmont Rd., Louisville 18, Ky.—Chief, Surveys Branch, Louisville District, Corps of Engineers, U. S. Army

BOLENDER, Bernard J., Jr., 687 Madison Ave., Lindenhurst, N. Y.

BOUILLON, Edwin J., Jr., 3700 53rd St., Sacramento 20, Calif.—Party Chief, Division of Beaches & Parks, State of California

BOUNDS, James E., Lumberton, Miss.—Land Surveyor

BOWE, Leonard M. M., P. O. Box 391, Nassau, Bahamas—Land Surveyor, Aranha and Chee-A-Tow, Ltd.

BOWER, Richard S., 2700 Polk St., Apt. 8, San Francisco 9, Calif.—Surveyor, Pacific Gas and Electric Co.

BRANTLEY, H. L., 54 Radcliff Rd., Springfield, Ill. —Aerial Surveys Engineer, Div. of Hwys., State of Illinois.

BRANTLEY, Kirby H., 3624 Figueroa Dr., San Leandro, Calif.—Land Surveyor, Pacific Gas and Electric Co.

BRAUN, William J., 3908 Covington Rd., South Euclid 21, Ohio—Engineer, William J. Braun and Associates

BROCKMAN, William H., 1062 Helen Ave., Yuba City, Calif.—Surveyor, Corps of Engineers, U. S. Army

BROWN, Horace L., 135 N. 21st St., Newark, Ohio —Civil Engineer, City of Newark

BURNS, Mrs. Betty G., 8208 Mercier, Kansas City 14, Mo.—Cartographic Technician, Army Map Service

BURNSTINE, Monroe, Moe-Bet Mobile Manor, Route 1, Box 52, Moline, Ill.—Surveyor, DeLeum, Cather and Co.

BURRAS, Arthur L., North Fairfield, Ohio—Registered Land Surveyor, Arthur Burras and Associates

BUSBY, Sidney R., 2566 Westminster Ave., Salt Lake City, Utah—Engineer, Mountain Fuel Supply Co.

CALDWELL, Norman C., 217 E. 13th St., Box 372, Mio, Mich.—Survey Chief, Michigan State Highway Department

CALLAGHAN, Henry R., 825 N. Broadway, Santa Ana, Calif.—Title Engineer, Security Title Insurance Co.

CAMERON, Robert E., 118 Coronation Dr., Dedham, Mass.—Surveyor and Engineer, Manager, Harry R. Feldman, Inc.

CARNEGIE, Orris, Linn County Surveyor, Court House, Albany, Ore.—County Surveyor, Linn County

CHAMPION, D. F., 410 Drew St., Houston 6, Tex.

CHEATHAM, Ben F., 739 Pitt St., Mt. Pleasant, S. C.—Civil Engineer and Land Surveyor

CIRCLE, John, 187 Sinsbury Dr., Worthington, Ohio—Engineer and Surveyor

COLE, Homer A., 246 E. 305th St., Willowick, Ohio —Civil Engineer and Surveyor

COLES, Melvin W., 32 Anacostia Rd., N.E., Washington 19, D. C.—Cartographer, U. S. N. Hydrographic Office

COLLAGAN, Edward H., Jr., 30 Glover Ave., Quincy 71, Mass.—Student Engineer, Town of Weymouth, Mass.

COLLIER, Earnest J., Route 1, Ripley, Miss.—Surveyor, Tippah County

COMPTON, Jack C., 10508 Shoshone Ave., Granada Hills, Calif.—Surveyor, Fairchild Aerial Surveys, Inc.

COPELAND, Alton E., P. O. Box 1188, Houston 1, Texas—Surveyor, Houston Pipe Line Co.

COURTRIGHT, Fred V., 433 4th St., N., St. Petersburg, Fla.—Surveyor-Engineer, Honnicutt and Associates, Inc.

COVEY, John C., 1328 Prudential Bldg., Buffalo 2, N. Y.—Land Surveyor

CUMMING, Charles W., Jr., 78 Glendale Place, Port Chester, N. Y.—Land Surveyor, Philip W. Genovese and Associates

CRAMPTON, Laurence H., P. O. Box 430, Monticello, Fla.—Manager Tungston Plantation

CURLEY, John J., 115 Moody Ave., Fairfield, Conn. —Party Chief, Town of Trumbull

DAILEY, John E., 12503 Marston Ave., Cleveland 5, Ohio—Surveyor in Training, The East Ohio Gas Co.

DAKIN, A. H., Keystone Bldg., Mill Valley, Marin, Calif.—Land Surveyor, Comstock Engineering

DANDO, Elon E., 171 Durazno Way, Menlo Park, Calif.—Regional Manager, Aero Service Corp.

DARLING, Edward L., R. F. D. 4, Binghamton, N. Y.—Civil Engineer, McFarland and Johnson

DAVIS, Alex. L., P. O. Box 25, Gilchrist, Tex.— Construction Inspector

DAVIS, John A., 208 S. Walnut St., Bucyrus, Ohio —Registered Engineer and Surveyor

DAWSON, John H., 412 Main St., Madison Heights, Va.—Party Chief, C. H. Kirkland Campbell Co.

DeBELLA, Salvatore J., 322 Hoffman Lane, Hauppauge, N. Y.—Office Engineer, Industrial Rayon Corp.

DEBESIS, John J., 4255 E. 99th St., Cleveland 5, Ohio—Chief Engineer, Catholic Cemeteries Association

DEFREESE, Roy, Poplarville, Miss.—Land Surveyor

DORE, Richard F., 119 Belmont Ave., Ottawa 1, Canada—Chief of Surveys, National Capital Commission

DOSKINS, Eriks, 1010 East 17th Ave., Apt. 10, Denver 18, Colo.—Civil Engineer, U. S. Geological Survey

ECKHOLM, Richard J., 10223 Crenshaw Blvd., Inglewood 4, Calif.—Chairman, Development Consultants, Inc.

ELLIOTT, Michael S., 1438 Palm Dr., Oxnard, Calif.—Student, Ventura College

FERRELL, Gordon S., Pacific Gas and Electric Co., Land Dept., 245 Market St., San Francisco 6,

Calif.—Supervising Field Engineer, Pacific Gas and Electric Co.

FERRIS, John P., 2814 Stratford Ave., Cincinnati 20, Ohio—Land Surveyor and Engineer, Southern Railway Co.

FISCHER, Valentine C., 2570 Cherry St., Toledo 8, Ohio—Engineer-Surveyor, Physics Dept., Central Catholic High School

FLETCHER, C. Harry, 351 Crestwood Ave., Akron 2, Ohio—Engineer-Surveyor

FLOWERS, Fred F., P. O. Box 238, Findlay, Ohio —President, Differential Company

FODOR, James Robert, 718 North 3rd St., Toronto, Ohio—Surveyor, Ohio Edison Co.

FRAVEL, Francis E., 1560 Marysville Rd., Delaware, Ohio—Surveyor, State of Ohio

FRY, Clifton J., Jr., 2913 16th Rd., S., Arlington 4, Va.—Civil Engineer, U. S. G. S.

GALLEGOS, Ernest E., Room 1305, Office of Chief of Engineers, U. S. Army, Washington 25, D. C. —Engineer

GAMA, George, 1909 Virginia St., Bakersfield, Calif.—Draftsman, Kern County Land Co.

GARD, Harry D., 750 Furnace St., Elyria, Ohio—Civil Engineer, City of Elyria

GASBARRE, Ray W., P. O. Box 157, Wooster, Ohio —Surveyor, Murphy, McDaid and Gasbarre

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New Hydrographic Ship Launched

The *C.H.S. Maxwell*, plans for which were noted in SURVEYING AND MAPPING, Vol. XXI, No. 1, March, 1961, page 139, was launched August 17, 1961, at the Halifax shipyards of the Dominion Steel and Coal Corporation, by Mrs. Paul Comtois, wife of Mines and Technical Surveys Minister Comtois. Following the launching Mr. and Mrs. Comtois and other officials of the Department of Mines and Technical Surveys paid a visit to the Bedford Institute of Oceanography now under construction at Dartmouth and scheduled for completion next fall.

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Now Hear This

Aero Service Corporation has been awarded a $600,000 contract for a property map and records system covering Davidson County, Tennessee. Final products will be some 1,500 map sheets 24″ × 36″ in size and at scales of 1: 600; 1: 1,200; and 1: 4,800, as well as a set of cross-indexed, property-record cards and alphabetical index cards, to supplement information shown on the maps.

The U. S. Geological Survey has announced the completion of the "New York and Vicinity" map, an eight-sheet map at the scale of 1: 24,000. Each of the eight sheets is a composite of four 7½-minute quadrangles.

An extraordinarily thin Ruwe smudge-proof plastic pencil lead for use on polyester drafting film and water-resistant pencil cloth has been announced by the Keuffel & Esser Co. The lead is 0.036 inch in diameter and designed to fit any fine-line mechanical pencil. Further information may be obtained from Keuffel & Esser Co., Third and Adams Streets, Hoboken, N. J.

A model 3300 DATAPLOTTER, designed by Electronic Associates, Inc., Long Branch, N. J., is being used by a New York firm of consulting engineers, King & Gavaris, to plot highway cross-sections, and a speed of 400 cross-sections per day is claimed.

A sixteen-page booklet which gives instructions on working with acetate proofs of type and art; how to cut, lay, burnish, remove, or prepare for printing, microfilming or other reproduction is available without charge from Service Composition, Mail Order Division, 304 Chapel Avenue, Haddonfield, N. J.

Nearly 400 delegates attended the 46th National Conference on Weights and Measures, June 12–16, 1961, in Washington, D. C., with weights and measures officials representing 35 States, the District of Columbia, and the Commonwealth of Puerto Rico. Also represented were the Institute of Weights and Measures Administration of Great Britain and the Standards Division of the Department of Trade and Commerce of Canada.

Two new mobile elevation meters, designed to determine relative land elevation automatically, have been purchased by the U. S. Geological Survey and are now being used in its topographic mapping operations.

Thirteen field parties of the Geographical Branch of the Department of Mines and Tech-

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nical Surveys were making studies across Canada this summer, ranging from the investigation of a small polar glacier on the northern fringe of the Queen Elizabeth Islands to the mapping of land use in eastern New Brunswick.

More than a dozen parties from the Dominion Observatories of the Department of Mines and Technical Surveys were working in various areas of Canada this summer on an extended program of mapping the earth's gravity, magnetism, and seismic characteristics.

Charles Parks, survey chief of the Maryland State Roads Commission, told a "Conference on Improved Highway Engineering" that the Tellurometer has reduced the cost and time of traversing approximately 50% and greatly improved the accuracy of horizontal control for mapping new superhighway routes.

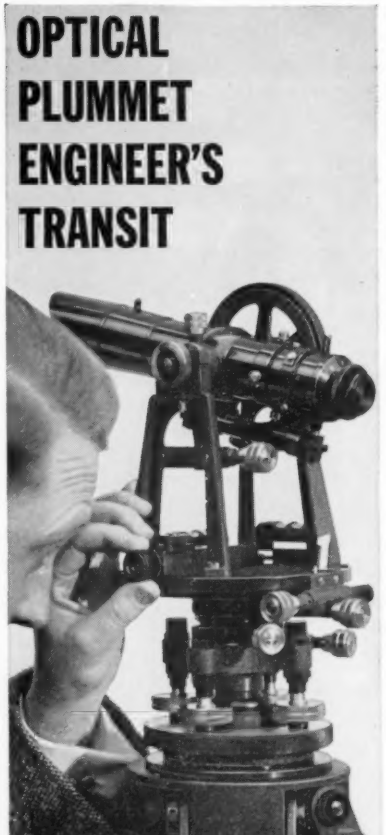
The Board of Governors of the International Science Foundation has recently proposed to the San Francisco Port Authority that a $65,000,000 International Science Center be developed on the San Francisco Embarcadero. The area presently occupied by Piers 1, 3, 5, and 7 would be redeveloped by the Foundation if the proposal is accepted by the Port Authority. The Center would become the first element of Cyril Magnin's "Embarcadero City" plan for redevelopment of the waterfront.

LogEtronics Inc., of Alexandria, Virginia, has announced the acquisition of Lithoflo Graphic Arts Film Processor patents from the Xerox Corporation of Rochester, New York. The Lithoflo Processor is an automatic machine to develop, fix, and wash cut sheets of film or waterproof paper up to 20 inches in width.

Dedication ceremonies at the new Engineering Center of West Virginia University, Morgantown, West Virginia, were held on October 6, 1961, and formed the central feature of a three-day conference on engineering manpower problems in the 60's and a two-day meeting of the West Virginia Society of Professional Engineers.

Kargl Instruments, Inc., San Antonio, Texas, formerly Kargl Company, Inc., is entering on a program of increased production and research in the photogrammetric and other precision equipment field. Gilard Kargl will serve as Executive Vice President and will devote his time entirely to research and development projects. Harry Evons has been elected Chairman of the Board and President of the new company.

Appointment of Eric F. Burtis to the newly-created post of Audio-Visual market manager



for Keuffel & Esser Co., is that company's first step toward a more active participation in the audio-visual market.

On October 2, 1961, John Wiley & Sons, Inc., and Interscience Publishers, Inc., formally merged the two companies to establish one of the world's largest publishing houses devoted entirely to the production of books and journals in the various fields of natural and behavioral sciences, technology, and engineering. Operating under the name of John Wiley & Sons, Inc., with offices at 440 Park Avenue South, the combined enterprise will offer an integrated line of scientific publications, including textbooks, encyclopedias, research monographs, scientific journals, abstracts, and paperbacks. The Interscience publishing program will continue as a distinct Wiley division.

Keuffel & Esser Co., was scheduled to exhibit for the first time at an international trade fair with its exhibit at the Pacific International Trade Fair in Lima, Peru, October 12–29, 1961. The exhibit was to be a part of the section sponsored by the U. S. Government. Approximately 40 U. S. firms were to be represented in the United States pavilion, which contained 66,000 square feet of exhibit area.

A 257-page, illustrated study—Optics in Equipment for the Utilization of Solar Energy—was published in Moscow in 1959. Translated recently for the Atomic Energy Commission, the work is available in English from the Office of Technical Services. (Order AEC-tr-4471 from OTS, U. S. Department of Commerce, Washington 25, D. C. Price $3.50.)

The United States Patent Office, established in 1836, celebrated 125 years of continuous service this year. On September 12, 1961, the 3,000,000th patent was issued. This patent covered a magnetic device for processing checks rapidly.

The 1961 Carl W. Keuffel scholarship has been awarded to Nicholas A. Sileo of Elizabeth, N. J. This scholarship is awarded annually to an outstanding, high-school graduate planning to study engineering at the Stevens Institute of Technology. The award was made at the annual dinner of the New Jersey Society of Professional Engineers.

Six engineers from Geological Survey are in Antarctica to conduct field surveys for topographic mapping in connection with the 1962 United States Antarctic Research Program. A specialist in aerial photography will headquarter in New Zealand for liaison with the Navy photographic squadron. The men will collect mapping data in previously unmapped areas, and will serve as navigators on traverse parties engaged in a variety of scientific work. This is the fifth consecutive year during which Survey personnel have participated in Antarctic mapping activities. The field effort during the current season will be contributory to a $303,000 Antarctic mapping program sponsored by National Science Foundation as part of the U. S. Antarctic Research Program. Air transportation and logistical support during Deepfreeze 62 are to be provided by both the Army and the Navy.

Karo Award Presented for First Time

The Karo Award, a plaque named for the Director of the U. S. Coast and Geodetic Survey, was presented for the first time on May 15, 1961, at the Annual Military Engineer Dinner, at the Mayflower Hotel in Washington, D. C. Rear Admiral H. Arnold Karo is past president of both the Society of American Military Engineers and the American Congress on Surveying and Mapping.

Authorized for presentation for the first time for 1960, the award will be offered annually to the Coast and Geodetic Survey field unit which makes an outstanding contribution in the engineering and scientific field.

The Louisiana Low Water Line Survey Party received the first award in recognition of its outstanding contributions to the advancement of engineering and surveying resulting in the successful mapping of the mean low water line and the mean high water line of inaccessible areas of the coast of Louisiana within a tolerance of 0.1 foot.*

The members of the party receiving the award are: Clem E. Arens, Wesley M. Butler, Donald L. Campbell, Howard Derrickson, Robert W. Franklin, Ernest Hartford, Wesley V. Hull, Bennett G. Jones, Michael R. Moore, Austin Poling, William M. Reynolds, Victor E. Serena, Matthew A. Stewart, Charles K. Townsend, and Joseph K. Wilson.

**See* "Mapping the Low Water Line of the Mississippi Delta," by Bennett G. Jones and William Shofnos, SURVEYING AND MAPPING, Vol. XX, No. 3, September 1960, pages 319–330.

Philippine Surveying and Mapping Institute

Officers and representatives of several different surveying and other, allied, technical organizations in the Philippines convened at the office of the Board of Technical Surveys and Maps* of the Republic of the Philippines, at 234 Tanduay Street Manila, on June 29, 1961, and organized the Philippine Surveying and Mapping Institute, an organization dedicated to the advancement of the sciences of surveying and mapping in their several branches in the furtherance of the public welfare.

Those present during the organizational meeting were: Professor Nicanor G. Jorge, Amando A. Salvador, Reynaldo Bautista, all from the Bureau of Lands; Commander Marcelino S. Tabin, Anastacio V. Torrijos, Apalonio S. Evalle, Filomeno L. Corton, and Tim V. Certeza, Jr., from the Board of Technical Surveys and Maps; Norberto S. Vila and Felipe F. Cruz, from the Philippine Society of Geodetic Engineers; Director Isidro S. Macaspac, from the National Economic Council; Jesus C. Perlas, from the National Waterworks and Sewage Authority; Francisco H. Huelgas and Augustin M. Olay, from Survey Contractors, Inc.; Captain Severo B. Barrios, Jr., from the 516 EBTCo., OCE, GHQ, AFP; and Julian B. Santos from the Land Surveyors Association of the Philippines.

The constitution and bylaws of the Institute were drafted during the meeting.

Ad interim officers who were elected are: Commander Marcelino S. Tabin, *President;* Felipe F. Cruz, *Vice President;* Tim V. Certeza, Jr., *Executive Secretary;* Julian B. Santos, *Treasurer;* Amando A. Salvador, *Editor-in-Chief;* Nicanor G. Jorge and Jesus C. Perlas, Board Members. These officers also compose the present Executive Committee of the Institute.

The ad interim officers of the new Institute were inducted by the Honorable Alejo S. Santos, Secretary of National Defense, who is also Chairman of the Board of Technical Surveys and Maps, during the First Anniversary celebration program of that Board at the Philippine Navy Officers' Club in Manila on July 26, 1961, at which time a message on the importance of coordinated planning in surveying and mapping from the President of the Philippines, Carlos P. Garcia, was conveyed.

The Institute publishes a quarterly—the *Philippine Surveying and Mapping Journal*—and the first issue, Vol. 1, No. 1, is dated July-September 1961. The Editor-in-Chief, Amando A. Salvador, may be addressed at 234 Tanduay St., San Miguel, Manila. P. I.

* The Board of Technical Surveys and Maps was created by Philippine Republic Act 2912, which was approved to be effective July 19, 1960. The Hon. Marcelino S. Tabin is Vice Chairman and Executive Director of the Board.

Mount Erebus Remeasured

Engineers of the Geological Survey, engaged in mapping operations in the vicinity of McMurdo Sound, Antarctica, made observations and measurement with theodolite and Tellurometer during the 1960–61 austral summer season, to come up with a new figure of 12,280 feet for the elevation of Mount Erebus, Antarctica's famous smouldering volcano on Ross Island.

Sir Robert Falcon Scott, leader of the ill-fated British Antarctic Expedition of 1910–13, first computed the height of Mount Erebus to be 13,200 feet. A later survey produced an elevation of 15,325 feet, while cartographers have recently used a figure of 14,997 feet.

Not until this past austral exploration season was it possible to measure accurately by electronic methods a base line sufficiently long to provide more precise information. Survey engineers Leslie B. Robison of Rolla, Mo., and George R. Staeffler of Denver, Colo., measured a base line 16 miles long between Black and Brown Islands in the Ross Sea. From each end of the base line both horizontal and vertical angles were measured to the peak, and the revised elevation was calculated.

Mount Erebus was discovered in 1841 by Sir James Clark Ross who named it for the flagship of his expedition. Future events may prove that Erebus may have to share its reputation as an active volcano with Mount Terror, also on Ross Island and hitherto labeled "extinct." During the past season an observer on the Coast Guard Icebreaker "Eastwind" thought he detected a persistent wisp of vapor rising from the summit caldera. Terror, named for the second ship in the Ross expedition, is about 20 miles east of Erebus.

Western Regional Conference—ACSM

The Arizona Section of the ACSM is feeling a justifiable satisfaction in the outcome of our recent Western Regional Conference, held at Phoenix, Arizona, in the Westward Ho Hotel, October 18–21, 1961. Registration was somewhat over 300. Our guest list represented communities from Houston to Seattle, Kansas City to San Francisco, the Great Lakes, New England, and the Nation's Capital.

We were honored by the presence of our National President, Brother B. Austin Barry; Vice President and Executive Secretary, Walter S. Dix; and members of the ACSM's Board of Direction, who met in executive session concurrently with the Conference. It was rumored that the Board resolved to re-name our President "S. Legree" Barry! Happily, this hard-working group was able to enjoy the social events and luncheons.

A full program of interesting and informative technical papers by authorities in virtually every line of surveying and allied enterprises was the "meat" of the Conference. Much credit is due to the constructors of these excellent reports, as well as to Technical Chairman Philip Newlin.

The exhibits were interestingly displayed and well staffed, comparing favorably with any we have seen. Most lines of surveying equipment, and computing and reproduction services were represented. Our thanks and appreciation to the exhibitors.

Social events, ranging from the Exhibitor's Cocktail Party and a "Night on the Town" (for hardy members), through a Western barbecue, culminating in a dinner dance at a beautiful resort hotel, were well attended and enjoyed by all. A complete program for the ladies was presented by our Arizona Section ladies. A report is submitted concurrently with this.

Much favorable comment was received on the quality of all facets of the Conference, and of the stature of the people responsible for its excellence. Especially gratifying were the complimentary remarks between guests who didn't know they were being overheard.

The Arizona Section, in its third year of organization, can be justly proud of a fine job. As Chairman I wish publicly to express my sincere thanks to the many men and women who made this undertaking a success; as well as to the many organizations who gave unstintingly of their money, personnel, and equipment. Special thanks to General Chairmen Carl Chadwick and Clyde Armstrong and to Womens Chairman Clare Lange, without whom this job could not have been done.

The presence of our guests from near and far was most rewarding. It was a pleasure to meet and entertain you.

—Robert L. Frazer
Chairman, Arizona Section

Women's Activities

Wives of the members of the Arizona Section, of the American Congress on Surveying and Mapping were very active at the Western Regional Conference.

The advance planning for the Ladies Activities was under the direction of Mrs. James Lange, Phoenix, as Chairman. Twenty interested women took part in the plans and the duties of the activities for the ladies who were our guests.

A Registration and Information Committee, with Mrs. Carl Chadwick and Mrs. Charles Purdue as Co-chairmen, was helpful in giving assistance to the ladies upon their arrival at the Conference.

The fifty-two ladies who were our guests enjoyed the friendliness extended by Hostess Chairman, Mrs. Hanen Williams, and her Hostesses. Refreshments were served throughout the day in their Hospitality Room. Small groups of ladies enjoyed sightseeing and shopping tours in Phoenix, as well as bridge games, which were arranged by Mrs. Don Scott and her committee.

Thursday morning twenty-nine ladies boarded a bus for a sightseeing trip through the mountainous, residential areas surrounding Phoenix; then on to Scottsdale, Arizona, for a no-host lunch and a shopping tour in the West's most Western town. The guides for this outing were Mrs. Bobby Ramsey and her committee.

A Brunch and Style Show on Friday morning was held at Diamond's Department Store of Park Central. Mrs. John Bagshaw was responsible for this most delightful meal and show.

The ladies of the Arizona Section feel greatly privileged to have been hostesses to the Western Regional Conference.

—Clare Lange
Womens Chairman

Arizona Section Chairman, Bob Frazer, writes: "I want to express my appreciation for the opportunity to get to know the National Officers of the ACSM. We are no longer just

'names' to one another—but 'people.' This specifically, is what the ACSM is doing—we know more surveyors through the ACSM . . . we get to know one another."

Official ACSM would like to take this opportunity to thank the Arizona Section, and the Western Regional Conference Committee, for the excellent preparation for and the smooth running of the four-day convention, exhibits, tours, social affairs, and a much-commended program of technical and professional papers. Chairman Clare Lange and the Ladies Auxiliary of the Arizona Section, ACSM, are to be congratulated for spirited support of the convention operations and their friendly hospitality. In particular, the Board and Officers of the ACSM wish to thank Section Chairman Bob Frazer, Convention Chairmen Carl Chadwick and Clyde Armstrong, and their committeemen, not only for a job well done but for the warm and very friendly personal attention shown to all of us.

For the ACSM Board of Direction,
WALTER S. DIX, *Executive Secretary*

ACSM WESTERN CONFERENCE COMMITTEE

Left to right, front row—Bobby Ramsey, George Zimmerman, John Bagshaw, and Carl Chadwick. *Back row*—Anson Potter, Ray Freise, Robert Frazer, Robert Foose, and James Lange.

ACSM BOARD OF DIRECTION

Wednesday morning session (Oct. 18) at Phoenix. *Left to right, front row—Directors,* Moore and Clemens; *Vice President,* Dix; *President,* Barry; and *Directors,* Bill and Bell. *Back row—Past President,* Williams; *Directors,* Emminizer and Bestor*; and *Committee Chairman,* McAlinden.

* Also a Past President of the ACSM.

ACSM WESTERN REGIONAL CONFERENCE PHOENIX, ARIZONA, OCT. 18–21, 1961.

Opening session (*left to right*)—Robert L. Frazer, Chairman, Arizona Section, ACSM; Wade Gibbons, representing Governor Paul Fannin; Sam Tucker, City Engineer, Phoenix; and Walter S. Dix, Vice President and Executive Secretary, ACSM. NOTE.—Mayor Mardian of Phoenix, not in the picture, gave the address of welcome at the opening session.

ACSM F.I.G. COMMITTEE MEETS DURING PHOENIX WESTERN CONFERENCE

Left to right, front row—G. K. Emminizer, 1963 affairs; W. S. Dix, ex officio, ACSM; G. C. Bestor, coordinator; C. J. Aggeler, Comm. V, Young Surveyors. *Back row*—Bro. B. Austin Barry, Comm. VII, Education; J. L. Bell, Comm. VI, Professional Fees; W. B. Williams, Comm, II, Cadastre; R. M. Berry, Comm. I, Dictionary. NOTE.—Messrs. S. V. Griffith and W. C. Cude, Comm. III, Methods and Equipment, were attending another meeting when this photograph was taken.

President's Message

Greetings of the Season

It is my pleasure to wish you all a Most Happy Christmas and a Blessed New Year. In this era when we can only guess what history will say of it, let us be thankful for the freedoms we have and work and pray hard to preserve and strengthen them. Vice President Walter S. Dix and the Board of Direction join me in this wish for you at this season.

Business of the Moment

I take this opportunity to peruse with you the current happenings in the ACSM, with which you are now becoming familiar: the scheme for our development. Bulletin No. 1 reported the Board of Direction's action at Phoenix in October, based upon the report of the Financial and Administrative Matters Committee. You should now or soon have the text of that report in hand for study. From this material—and more to come—you will have a fairly complete picture of what is proposed: a scheme for the Congress to grow into a living, thriving organization, of ever-increasing stature.

The major items in the proposal are these: a program of increased activity and service to the membership; a division of the membership into two categories, Member and Fellow; and an increase of the dues. These moves will aim to strengthen the ACSM as an organization, to make professional membership therein more meaningful, and to assure the progress we all have a right to expect. The pre-professional man, the Member, would with his $10 dues be carrying his fair share of the burden rightfully his to carry. The professional man, the Fellow, would by his $20 dues be carrying his fair share too, the extra being the amount spent on professional activity in his behalf.

Open for Suggestions

We ask you now to ponder, debate, discuss, and write positively on the proposal. Submit your best thoughts in accordance with the procedure suggested. While the door will never be closed on constructive suggestion, it is during the winter and spring that it is planned to pin down all the details and procedures. Criteria for membership classification must be worked out within the Divisions, and necessary constitutional changes readied. Programs for services to the membership (many put off in the past for want of needed funds) will have to be prepared, both general and divisional. The proper liaison with local Sections and Affiliates must be effected. And the proper role of the various Divisions within ACSM must be thoroughly worked out in a manner acceptable and beneficial to all.

The organization cannot longer survive as a going concern without a dues increase, nor will it be of all the service it should without the change proposed. Your Board of Direction has given the leadership in making its decision for progress and now hands the problem to you for study. We ask you to study it now and note your views, and ultimately, when the proposition is presented for approval in final forms, we ask that you vote it into being.

Hope for the Future

We are convinced that none of you is likely to admit that ACSM has outlived its usefulness, that it should not rather be the foremost surveying-mapping society in the nation. We feel that it can be if we pursue this suggested program firmly, wisely, and thoroughly. We must anticipate that belonging to the ACSM will always be both a proud possession and a thing that none of you will be able to do without. This is the reason that so many have been sacrificing so much to bring the program to you at this time. I hope with you that 1962 will be a great year in the life of the ACSM.

—Brother B. Austin Barry
President

NOTICE: F.I.G. 10th International—Official Dates

Dates for 10th International Congress of Surveyors at Vienna, Austria, are changed and set officially now as 24 August to 1 September 1962.

Notice to ACSM Membership

A report of ACSM's Board of Direction findings and recommendations resulting from the study and discussion of the Financial and Administrative Matters Committee, as presented to the Board at its meeting in Phoenix, Arizona, October 19–20, 1961, will be distributed to ACSM members in the form of a special bulletin as soon as possible before the end of the year, together with the report of the F & A Matters Committee, in order to seek members' viewpoints and comments as quickly as possible for further study by that committee and presentation to the Board of Direction before the coming annual meeting and convention in March 1962.

Twenty-year Cumulative Index

A Twenty-year Index of all articles published by ACSM in its Journal—SURVEYING AND MAPPING—from Volume I (1941) through Volume XX (1960), now in the compilation stage, has been approved for publication in limited supply. Copies are expected to be available in March 1962 or soon thereafter. ACSM members may obtain a copy free upon written request to ACSM Central Office, Room 430 Woodward Building, 733 15th St., N.W., Washington 5, D. C., as long as the supply lasts.

Graduate Scholarship in Surveying

The Official Board of the Illinois Registered Land Surveyors Association has approved a scholarship of $500 to be awarded to some Civil Engineering graduate who intends to continue into advanced study with a major in Surveying or Photogrammetry.

The recipient will be chosen on the basis of undergraduate grades, performance in surveying classes, interest in surveying, personal qualifications, and financial need. The selection will be made by the Education Committee of the IRLSA.

Applications will be received until May 1, 1962, from those who will graduate on or before August 1962. Announcement will be made early in June and the recipient may begin graduate study in September 1962. A study program will be worked out by an advisor on the surveying staff to include courses in Property Surveying, Error Analysis, Photogrammetry, Geodesy, and related subjects. Though the student may chose a minor in some other area, it is expected that he will major in Surveying and submit a thesis on one of the topics in this area.

The IRLSA has taken this step to bolster the intellectual resources of the surveying profession which now must meet demands far more critical than experienced in the past. It is hoped that this scholarship can be awarded each year and that in time a core of professionally competent surveyors will take their place in the State. It is also hoped that new State legislation will recognize this advanced study so that registration can be obtained in a shorter time.

In 1960, the IRLSA established the Rayner Surveying Award for the outstanding surveying student. This award has been received by Donald Magura and Carroll Dunn. In the spring of 1961, Raymond Hauschild was granted $250 enabling him to attend Summer Surveying Camp. The new Graduate Scholarship will replace the Summer Camp Grant, but the Rayner Surveying Award will continue to be presented at the Annual Civil Engineering Awards Convocation.

Additional information regarding this Graduate Scholarship may be obtained by contacting Professor Winfield H. Eldridge, 205 Surveying Building, University of Illinois, Urbana, Illinois.

Preview of ACSM Program 1962 ACSM-ASP Consecutive Meetings and Co-Exhibits

March 11–17, 1962, Shoreham Hotel, Washington, D. C.

ACSM Twenty-second Annual Meeting—March 11, 12, 13, 14—Sessions, Monday, Tuesday, and Wednesday morning.

ASP Twenty-eighth Annual Meeting—March 14, 15, 16, 17—Sessions, Wednesday afternoon, Thursday, and Friday.

ACSM PROGRAM

All Technical Divisions except Instruments will have separate Division meetings during the mornings of March 12 & 13. The Property Surveys Division will hold a separate session on Sunday, March 11, from 3:00 to 5:00 p.m. The ACSM-ASP Cocktail Party will be held Monday evening at 8:00 p.m. The ACSM Annual Business Meeting will be held at 10:00 a.m., on Wednesday, March 14. Plenary Sessions will be held on Monday and Tuesday afternoons and again on Wednesday morning.

KEY SPEAKER.—The speaker for the mid-convention general assembly will be Dr. Charles Stark Draper, Head of the Department of Aeronautics and Astronautics and the M.I.T. Instrumentation Laboratory, Massachusetts Institute of Technology, Cambridge, Mass. Dr. Draper is recognized as the inventor and developer of the inertial guidance systems that control far-ranging U. S. missiles, including the Polaris.

CARTOGRAPHY DIVISION.—In addition to technical papers outlining significant new research and development in the cartographic field, others on Soviet map-production methods, aeronautical charting requirements, and the challenge of deep-ocean hydrographic surveys, will be featured. At the Plenary Session on Tuesday afternoon, the "Evaluation of Cartographic Products, Methods, and Expression" will be given by Colonel Robert E. Herndon, Commander, USAF Aeronautical Chart and Information Center, St. Louis, Mo.

CONTROL SURVEYS DIVISION.—International Great Lakes Datum, State and Local Geodetic Control, Advance Developments in Surveying, What is a Gravity Anomaly?, Trilateration with the Model 4B Geodimeter, and The Application of Error Theory to the Evaluation of Geodetic Position are among the featured papers planned by the Control Surveys Division during its Technical Sessions. At the Plenary Session to be held Monday afternoon, the Control Surveys Division will sponsor three papers: "Blue Nile Geodetic Survey," "Satellite Frontiers in the Field of Geodesy," and "Geodetic and Survey Mapping Operations—Libya."

EDUCATION DIVISION.—Programmed is a panel discussion on "The Development of Special Schools for Teaching Surveying," or "The Enlargement of the Surveying Program in Selected Universities." A meeting of the Education Committee will also be held on the morning of March 13, after the panel discussion.

TOPOGRAPHY DIVISION.—The Topography Division will sponsor two papers at the Plenary Session, Monday, March 12. One is on the subject "International Activities in Surveying and Mapping" and will include present activities in mapping in the Antarctic. The other, "Mapping Lunar Topography," will describe the problems of setting up horizontal and vertical control for a topographic map of the moon, and the photographic and cartographic problems encountered. The Division meetings will include papers on Underwater Mapping, Satellite Photography, and Airborne Electronic Systems for Mapping. Other papers will discuss the importance of drainage portrayal on topographic maps and the topographic mapping of unusual features. There will also be papers outlining new developments in large-scale mapping and on modern techniques in highway surveying. Reports will be given by ACSM representatives at the last F.I.G. meetings.

PROPERTY SURVEYS DIVISION.—Getting off to an early start, the Property Surveys Division will hold a Business Meeting on Sunday afternoon at 3:00 p.m., to hear P.S.D. committee

reports. On Monday morning there are scheduled the P.S.D. Advisor's Meeting and committee reports. A joint panel discussion with the Education Division will be held on Tuesday morning. The P.S.D. Ethics Committee panel discussion of the "Land Title Survey" requirements will be held at 8:00 p.m., Tuesday, March 13.

INSTRUMENTS DIVISION.—In the Plenary Session to be held Tuesday afternoon, the Instruments Division will feature a paper on "Keeping Abreast of Instrumentation Development," by Alfred E. Busch, President, Keuffel & Esser Co., Hoboken, N. J.

ACSM CENTRAL.—During the Plenary Sessions to be held Tuesday afternoon, the Financial and Administrative Matters Committee will report on Fees, Dues, etc. ACSM will sponsor a Plenary Session on Wednesday morning which will feature a paper on "Adequate Maps—Forerunner of Progress," to be given by William S. Massa, T.V.A., Chattanooga, Tenn.

1962 ACSM-ASP CONVENTION
March 11-17, 1962
Shoreham Hotel, Washington, D. C.

Your Opportunity

The annual convention is planned and programmed for you—be sure to attend. Each year the two societies bring their membership together with representatives of equipment manufacturers, mapping establishments, and allied professional fields. This is your opportunity to acquaint yourself with the latest in equipment, techniques, or who's who in the mapping profession or surveying practice.

Technical Sessions

Important new developments often come to light for the first time at the technical sessions. This is your chance to get together with the experts and solve that problem that has been "bugging" you all the year.

ACSM Technical Sessions begin Monday.
ASP Technical Sessions begin Wednesday afternoon.

Exhibit Hall

Here you find everything you need to modernize your practice or your shop. Equipment, instruments, and materials of the latest design—and company representatives to discuss your needs. **Exhibitors**—contact Mr. Chester Slama, 818 Brice Road, Rockville, Maryland, for your reservation of exhibit space.

Social Activities

Our entertainment committee is busy working to provide an interesting social program for everyone. In addition to planned functions, why not take a tour of your Nation's Capital while you are here.

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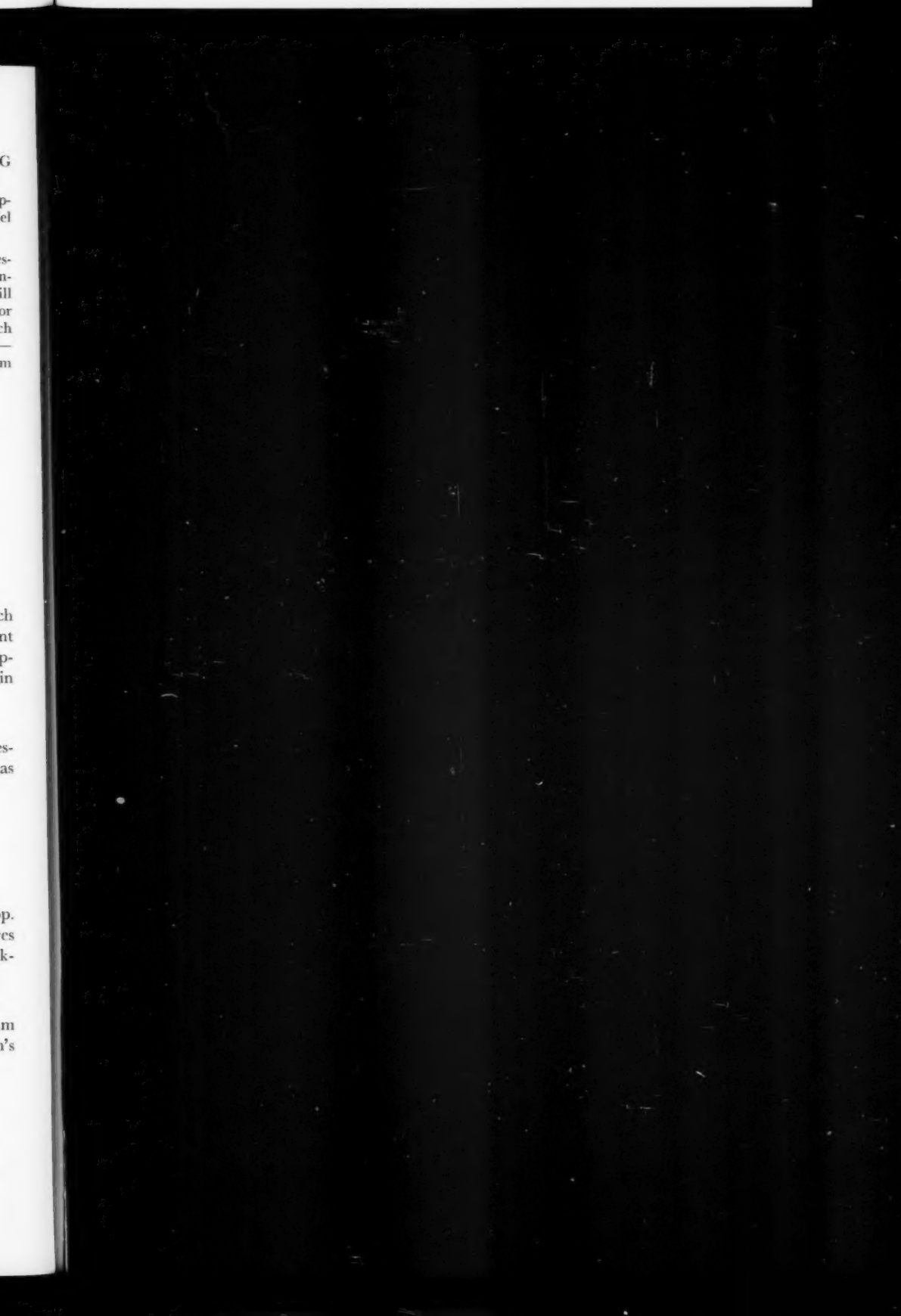

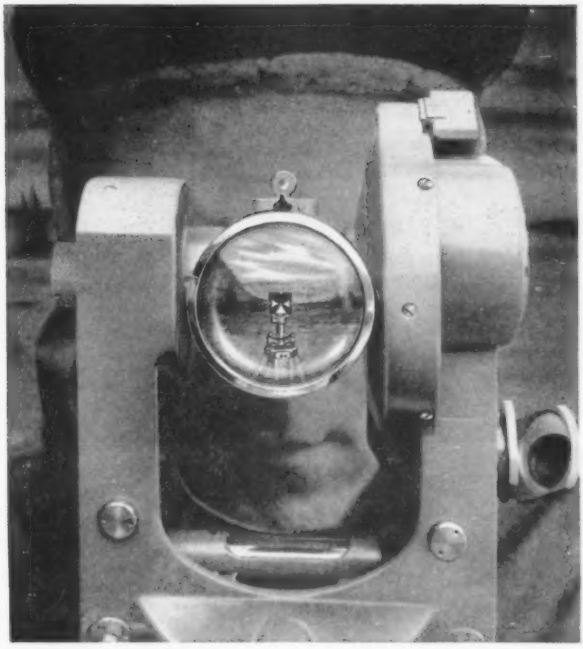

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